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U. S. Department
of Transportation
United States
Coast Guard

(2)

Report of the International Ice Patrol in the North Atlantic

PBY-5A *CATALINA* flew first IIP reconnaissance flights (1946)

1991 Season
Bulletin No. 77
CG-188-46

U.S. Department of Transportation
United States Coast Guard

Commandant (G-NIO)
United States Coast Guard

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Bulletin No. 77

REPORT OF THE INTERNATIONAL ICE PATROL
IN THE NORTH ATLANTIC

Season of 1991

CG-188-46

Forwarded herewith is bulletin No. 77 of the International Ice Patrol, describing the Patrol's services, ice observations and conditions during the 1991 season.

W. J. ECKER
Chief, Office of Navigation Safety
and Waterway Services

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INTERNATIONAL ICE PATROL
1991 ANNUAL REPORT

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Introduction

This is the 77th annual report of the International Ice Patrol (IIP). It contains information on Ice Patrol operations, environmental conditions, and ice conditions for the 1991 IIP season. The U.S. Coast Guard conducts the International Ice Patrol Service in the North Atlantic under the provisions of U.S. Code, Title 46, Sections 738, 738a through 738d, and the International Convention for the Safety of Life at Sea (SOLAS), 1974, regulations 5-8. This service was initiated shortly after tne sinking of the RMS TITANIC on April 15, 1912 and has been provided annually since that time.

Commander, International Ice Patrol, working under Commander, Coast Guard Atlantic Area, directs the IIP from offices located in Groton, Connecticut. IIP analyzes ice and environmental data, prepares daily ice bulletins and facsimile charts, and replies to requests for ice information. IIP uses aerial Ice Reconnaissance Detachments and, when necessary, surface patrol cutters to survey the southeastern, southern, and southwestern regions of the Grand Banks of Newfoundland for icebergs. IIP makes twice-daily radio broadcasts to warn mariners of the limits of all known ice.

Vice Admiral H. B. Thorsen was Commander, Atlantic Area until June 28, 1991, when he was relieved by Vice Admiral P. A. Welling, and Commander J. J. Murray was Commander, International Ice Patrol, during the entire 1991 ice year.

Summary of Operations, 1991

The 1991 IIP year (October 1, 1990 - September 30, 1991) marked the 77th anniversary of the International Ice Patrol, which was established February 7, 1914. IIP's operating area is delineated by 40°N - 52°N, 39°W - 57°W (Figure 1).

IIP's first aerial Iceberg Reconnaissance Detatchment (ICERECDET) of the year departed on February 21, and the 1991 IIP season was opened on February 23. From this date until August 23, 1991, an ICERECDET operated from Newfoundland one week out of every two. The season officially closed on August 24, 1991. Coast Guard HC-130H aircraft equipped with the AN/APS-135 Side-Looking Airborne Radar (SLAR) flew 39 ice reconnaissance sorties, logging over 246 flight hours, and Coast Guard HU-25B aircraft equipped with the AN/APS-131 SLAR flew 13 reconnaissance sorties, logging over 35 flight hours.

Watchstanders at IIP's Operations Center in Groton, Connecticut analyzed the iceberg sighting information from the ICERECDETs, along with sighting information from commercial shipping and Atmospheric Environment Service (AES) of Canada sea ice/iceberg reconnaissance flights and other sources. Table 1 shows that IIP ICERECDETs and commercial shipping were the major sources of iceberg sighting reports this season. Appendix A lists all iceberg sighting reports, including reports of radar targets, received from commercial shipping, regardless of the sighting location. In Appendix A, a sighting report may represent several targets.

Table 1
Sources of Sightings Entered into IIP's Drift Model

Sighting Source	Percent of Total
Coast Guard (IIP)	34.4
Commercial Ship	51.2
Other Air Recon	9.0
DOD Sources	0.8
Canadian AES	4.4
BAPS	0.0
Lighthouse/Shore	0.2
Other	0.0

As in 1990, AES flew almost no iceberg reconnaissance flights during 1991 because of a lack of funding. AES did acquire and relay to IIP a minimal amount of iceberg information obtained during sea ice reconnaissance flights. Atlantic Airways, the private company which provided aerial reconnaissance for the Canadian Department of Fisheries and Oceans (DFO) and the oil companies operating on the Grand Banks, continued to forward iceberg data acquired during flights to IIP. Unfortunately, though, DFO only conducted a small number of surveillance flights, and the oil industry did not have any platforms in the IIP area until near the end of the season.

During 1991, the IIP Operations Center received a total of 4370 sightings within its operations area (40°N - 52°N, 39°W - 57°W) and away from the Newfoundland coast which were entered into IIP's drift model, compared to 3156 during 1990. Sighting sources and percent of total reports

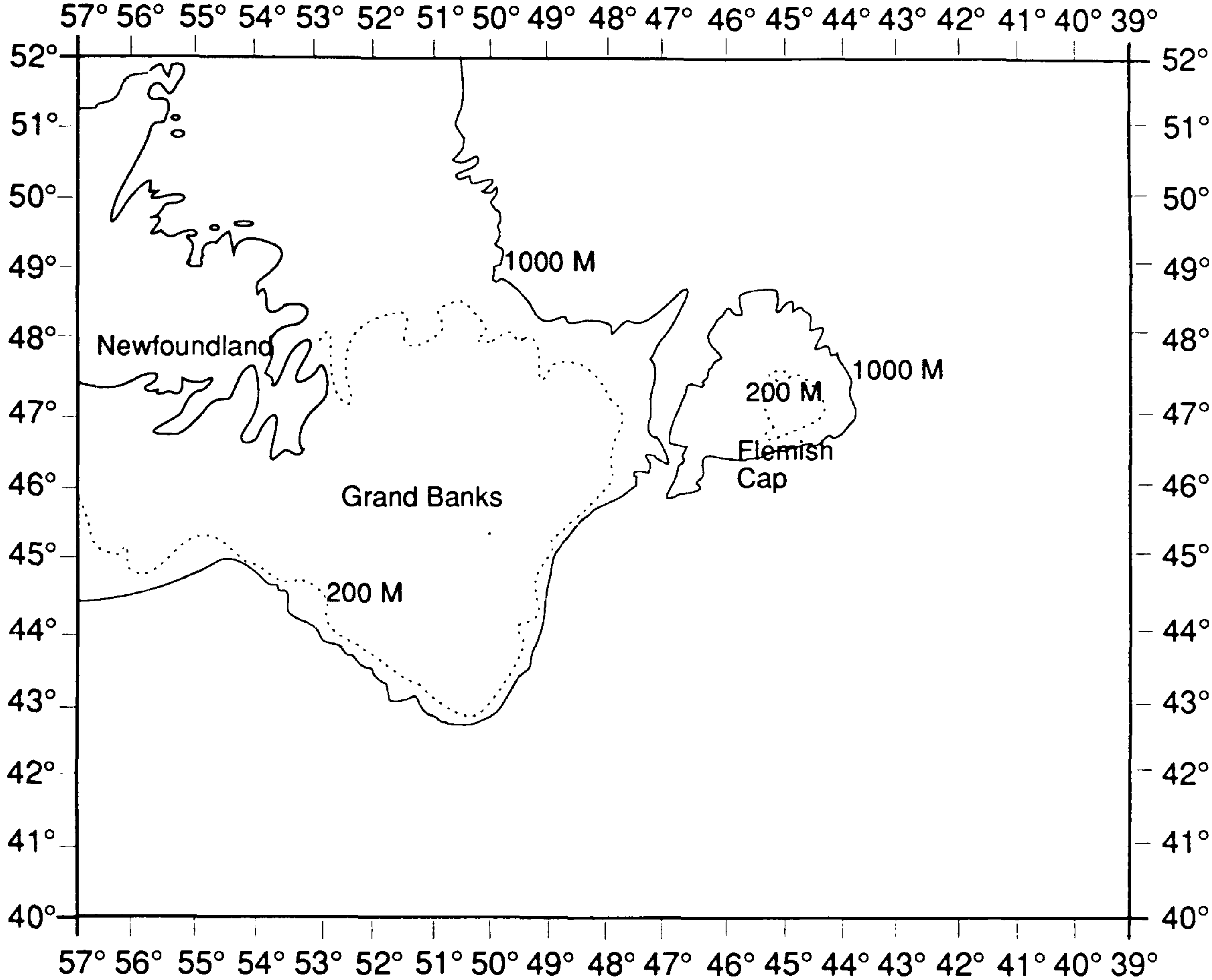


Figure 1. International Ice Patrol's Operation Area showing bathymetry of the Grand Banks of Newfoundland.

are in Table 1. The 4370 sightings entered into IIP's drift model represented only a fraction of the total sightings reported to IIP. Sightings of targets outside IIP's operations area or grounded or in areas of little or poorly defined current along the Newfoundland coast were not entered into the model.

Table 2 compares the estimated number of icebergs crossing 48°N for each month of 1991 with the monthly mean number of icebergs crossing 48°N from 1983 - 1990, the period during which IIP has been patrolling with SLAR-equipped aircraft. During the 1991 ice year, an estimated 1974 icebergs drifted south of 48°N latitude, compared to 793 during 1990. IIP defines those ice years with less than 300 icebergs crossing 48°N as light ice years; those with 300 to 600 crossing 48°N as average; those with 600 to 900 crossing 48°N as heavy; and those with more than 900 crossing 48°N as extreme. Thus, 1991 was an extreme year.

IIP's computer model consists of one routine which predicts the drift of each iceberg and another which predicts the deterioration of each. The drift prediction program uses a historical current file which is modified weekly using satellite-tracked ocean drifting buoy data, thus taking into account local, short-term, current fluctuations. Murphy and Anderson (1985) describe and evaluate the IIP drift model.

The IIP iceberg deterioration program uses daily sea surface temperature and wave height information from the U.S. Navy Fleet Numerical Oceanography Center (FNOC) to predict the melt of icebergs. Anderson (1983) and Hanson (1987) describe the IIP deterioration model in detail. It is the combined ability of the SLAR to detect icebergs in all weather and IIP's computer models to estimate iceberg drift and deterioration which enables IIP to schedule aerial iceberg surveys every other week rather than every week.

Twelve satellite-tracked ocean drifting buoys were deployed to provide operational data for IIP's iceberg drift model. Six buoys were the standard size drifting buoys IIP has been deploying for sixteen years. The other six were smaller

Table 2: Number of Icebergs South of 48°N during 1991 compared to the average for the period 1983-90, the SLAR reconnaissance period.

	Avg 1983-90	1991
OCT	1	0
NOV	1	0
DEC	2	0
JAN	2	0
FEB	33	20
MAR	86	115
APR	272	144
MAY	187	269
JUN	117	1030
JUL	78	325
AUG	19	71
SEP	5	0
Era Average	803	1974

drifting buoys which IIP evaluated during the 1990 and 1991 IIP oceanographic cruises. All buoys were equipped with temperature sensors. Drift data from the buoys are discussed in the IIP 1991 Drifting Buoy Atlas, available upon reqest.

During the 1991 season, IIP successfully deployed 57 Air-deployable eXpendable BathyThermographs (AXBTs). The AXBT measures temperature with depth and transmits the data back to the aircraft. Temperature data from the AXBTs were sent to the Canadian Meteorological and Oceanographic Center (METOC) in Halifax, Nova Scotia, Canada, the U.S. Naval Eastern Oceanography Center (NEOC) in Norfolk, Virginia, and FNOC for use as inputs into ocean temperature models. IIP directly benefits from its AXBT deployments by having improved ocean temperature data provided to its iceberg deterioration model. To further enhance the quality of environmental data used in its iceberg models, IIP also provided weekly drifting buoy sea surface temperature (SST) and drift histories and SLAR ocean feature analyses to METOC and NEOC for use in water mass and SST analyses. Canada's Maritime Command / Meterological and Oceanographic Centre provided 252 AXBT probes for IIP use, significantly increasing the temperature data IIP could obtain.

IIP conducted an oceanographic cruise aboard the USCGC BITTERSWEET (WLB 389) between April 29 and May 25, 1991 off the Grand Banks of Newfoundland. The objectives of the cruise were: 1) to conduct an operational evaluation of World Ocean Circulation Experiment (WOCE) drifters for use as current-measuring devices, 2) to determine the drift errors of the full-sized TOD's IIP uses, and 3) to provide surface truth for an evaluation of the APS-137 Forward Looking Airborne Radar (FLAR) aboard HC-130 aircraft as an iceberg sensor. Hydrographic stations were conducted during the cruise. The results will be published in a U. S. Coast Guard IIP Technical Report.

On April 18, 1991, IIP paused to remember the 79th anniversary of the sinking of the RMS TITANIC. During an ice reconnaissance patrol, two memorial wreaths were placed near the site of the sinking to commemorate the nearly 1500 lives lost.

Iceberg Reconnaissance and Communications

During the 1991 Ice Patrol year, 151 aircraft sorties were flown in support of IIP. Of these, 62 were transit flights to St. John's, Newfoundland, IIP's base of operations since 1989, and 52 were ice observation flights made to locate the southwestern, southern, and southeastern limits of icebergs. Ten research sorties were flown to evaluate the APS-137 Forward Looking Airborne Radar (FLAR), and 27 logistics flights were necessary to support and maintain the patrol aircraft. Tables 3 and 4 show aircraft use during the 1991 ice year.

Aerial ice reconnaissance was conducted with SLAR-equipped U. S. Coast Guard HC-130H and HU-25B aircraft. The HC-130H aircraft deployed from Coast Guard Air Station Elizabeth City, North Carolina, and HU-25B aircraft deployed from Coast Guard Air Station Cape Cod, Massachusetts.

The HC-130 'Hercules' aircraft has been the platform for Ice Patrol aerial reconnaissance since 1963. This was the fourth year for the HU-25B to serve as an Ice Patrol platform. Although IIP originally scheduled the HU-25B as the platform for slightly less than half of the 1991 ICERECDETs, the first HU-25B ICERECDET did not occur until June 26 because of the aircraft's involvement in Operations Desert Shield and Desert Storm. Furthermore, because of the severe iceberg distribution in late July, the scheduled ICERECDET platform was changed from an HU-25B to an HC-130. Thus, the HU-25B logged significantly fewer IIP flight hours in 1991 than in 1990, and the HC-130 consequently flew more hours. The total number of iceberg reconnaissance sorties was 52 in 1991, a small change from the 53 in 1990, but the total reconnaissance hours was 282.1 in 1991, compared to 256.6 in 1990. This increase in flight hours with a decrease in sorties is a reflection of the greater percentage of HC-130 sorties in 1991.

Table 3. AIRCRAFT USED DURING THE 1991 IIP YEAR.

Sorties

Aircraft	Transit	Patrol	Research	Logistics	Total
HC-130H	55	39	10	17	121
HU-25B	7	13	0	10	30
Total	62	52	10	27	151

Flight Hours

Aircraft	Transit	Patrol	Research	Logistics	Total
HC-130H	142.8	246.6	59.1	59.0	507.5
HU-25B	12.5	35.5	0	20.8	68.8
Total	155.3	282.1	59.1	79.8	576.3

Each day during the ice season, IIP prepares the 0000Z and 1200Z ice bulletins warning mariners of the southwestern, southern, and southeastern limits of icebergs. U.S. Coast Guard Communications Station Boston, Massachusetts, NMF/NIK, and Canadian Coast Guard Radio Station St. John's Newfoundland/VON were the primary radio stations responsible for the dissemination of the ice bulletins. Other transmitting stations for the bulletins included Canadian Forces Meteorological and Oceanographic Center (METOC) Halifax, Nova Scotia/CFH, Canadian Coast Guard Radio Station Halifax/VCS, Radio Station Bracknell, UK/GFE, and U.S. Navy LCMP Broadcast Stations Norfolk/NAM, Virginia, Thurso, Scotland, Keflavik, Iceland, Key West, Florida, and Rota, Spain.

IIP also prepares a daily facsimile chart graphically depicting the limits of all known ice for broadcast at 1600Z. U. S. Coast Guard Communications Station Boston assisted with the transmission of these charts. Canadian Coast Guard Radio Station St. John's/ VON and U.S. Coast Guard Communications Station Boston/NIK provided special broadcasts as required.

The International Ice Patrol requested that all ships transiting the area of the Grand Banks report ice sightings, weather, and sea surface temperatures via Canadian Coast Guard Radio Station St. John's/VON or U. S. Coast Guard Communications Station Boston/NIK. Response to this request is shown in Table 5. Appendix A lists all contributors. IIP received relayed information from the following sources during the 1991 ice year: Canadian Coast Guard Marine Radio Station St. John's VON; Canadian Coast Guard Vessel Traffic Centre/Ice Operations St. John's; Ice Centre Ottawa; Canadian Coast Guard Marine Radio Halifax/VCS; ECAREG Halifax, Canada; U.S. Coast Guard Communications and Master Station Atlantic, Chesapeake, Vir-

TABLE 4. ICEBERG RECONNAISSANCE SORTIES BY MONTH

MONTH	HU-25B SORTIES	HU-25B FLIGHT HOURS	HC-130 SORTIES	HC-130 FLIGHT HOURS	TOTAL SORTIES	TOTAL FLIGHT HOURS
JAN	0	0	0	0	0	0
FEB	0	0	0	0	0	0
MAR	0	C	7	48.8	7	48.8
APR	0	0	7	39.1	7	39.1
MAY	0	0	7	44.9	7	44.9
JUN	5	14.7	6	38.0	11	52.7
JUL	1	2.7	8	51.4	9	54.1
AUG	7	18.1	4	24.4	11	42.5
TOTAL	13	35.5	39	246.6	52	282.1

ginia; and U.S. Coast Guard Automated Merchant Vessel Emergency Response/Operational Computer Center, New York. Commander, International Ice Patrol extends a sincere thank you to all stations and ships which contributed.

Canadian Forces 727th Communications Squadron/ St. John's Military Radio served as the primary facility for air-ground communications, and the 726th Communications Squadron/Halifax Military Radio was the secondary facility.

Table 5
Iceberg and SST Reports

Number of ships furnishing Sea Surface Temperature (SST) reports	85
Number of SST reports received	337
Number of ships furnishing ice reports	395
Number of ice reports received	1297
First Ice Bulletin	231200Z FEB 91
Last Ice Bulletin	241200Z AUG 91
Number of facsimile charts transmitted	183

DISCUSSION OF ICE AND ENVIRONMENTAL CONDITIONS

Since more than 10,000 icebergs are calved by Greenland's glaciers into the Baffin Bay each year (Knutson and Neill, 1978), annual fluctuations in the generation of Arctic icebergs are not a significant factor influencing the number of icebergs passing south of 48° N annually. Rather than the supply of icebergs available to drift south to the vicinity of the Grand Banks, the factors that most determine the number of icebergs passing south of 48° N each season are those affecting iceberg transport (currents, winds, and sea ice) and the rate of iceberg deterioration (wave action, sea surface temperature, and sea ice).

The wind direction along the Labrador and Newfoundland coasts can affect the iceberg severity of each ice year since the mean wind flow can influence iceberg drift. Dependent upon wind intensity and duration, icebergs can be accelerated along or driven out of the main flow of the Labrador Current (Figure 2). Departure from the Labrador Current normally slows their southerly drift and, in many cases, speeds up their rate of deterioration.

The wind direction and air temperature indirectly affect the iceberg severity of each ice year by influencing the extent of sea ice. Sea ice protects the icebergs from wave action, the major agent of iceberg deterioration. If the air temperature and wind direction are favorable for the sea ice to extend to the south and over the Grand Banks of Newfoundland, the icebergs will be protected longer as they drift south. When the sea ice retreats in the spring, large numbers of icebergs will be left behind on the Grand Banks. Also, if the time of sea ice retreat is delayed by below normal air temperatures, the icebergs will be protected longer, and a longer than normal ice season can be expected. The opposite is true if the southerly sea ice extent is minimal, or if above normal air temperatures cause an early retreat of sea ice from the Grand Banks.

Sea ice also acts to impede the transport of icebergs by winds and currents. The degree to which an iceberg's drift is affected depends on the concentration of the sea ice and the size of the iceberg. The greater the sea ice concentration the greater the affect on iceberg drift. The larger the iceberg the less affected its drift is by sea ice. Although it slows current and wind transport of icebergs, sea ice is itself an active medium, continually moving toward the ice edge where melt occurs. Icebergs in sea ice will eventually reach open water unless grounded. The melting of sea ice is affected by snow cover (which slows melting) and air and sea water temperatures. As sea ice melt accelerates in the spring and early summer, trapped icebergs are rapidly released and then become subject to normal transport and deterioration.

The Labrador Current, aided by northwesterly winds in winter, is the main mechanism transporting icebergs south to the Grand Banks. In addition to transporting icebergs south, the relatively cold water of the Labrador Current keeps the deterioration of icebergs in transit to a minimum.

The following discussion summarizes environmental, sea ice, and iceberg conditions along the Labrador and Newfoundland coasts and on the Grand Banks of Newfoundland for the 1991 ice year. The sea ice information was derived from the Thirty Day Ice Forecast for Northern Canadian Waters published monthly by Ice Centre Ottawa, Atmospheric Environment Service (AES) of

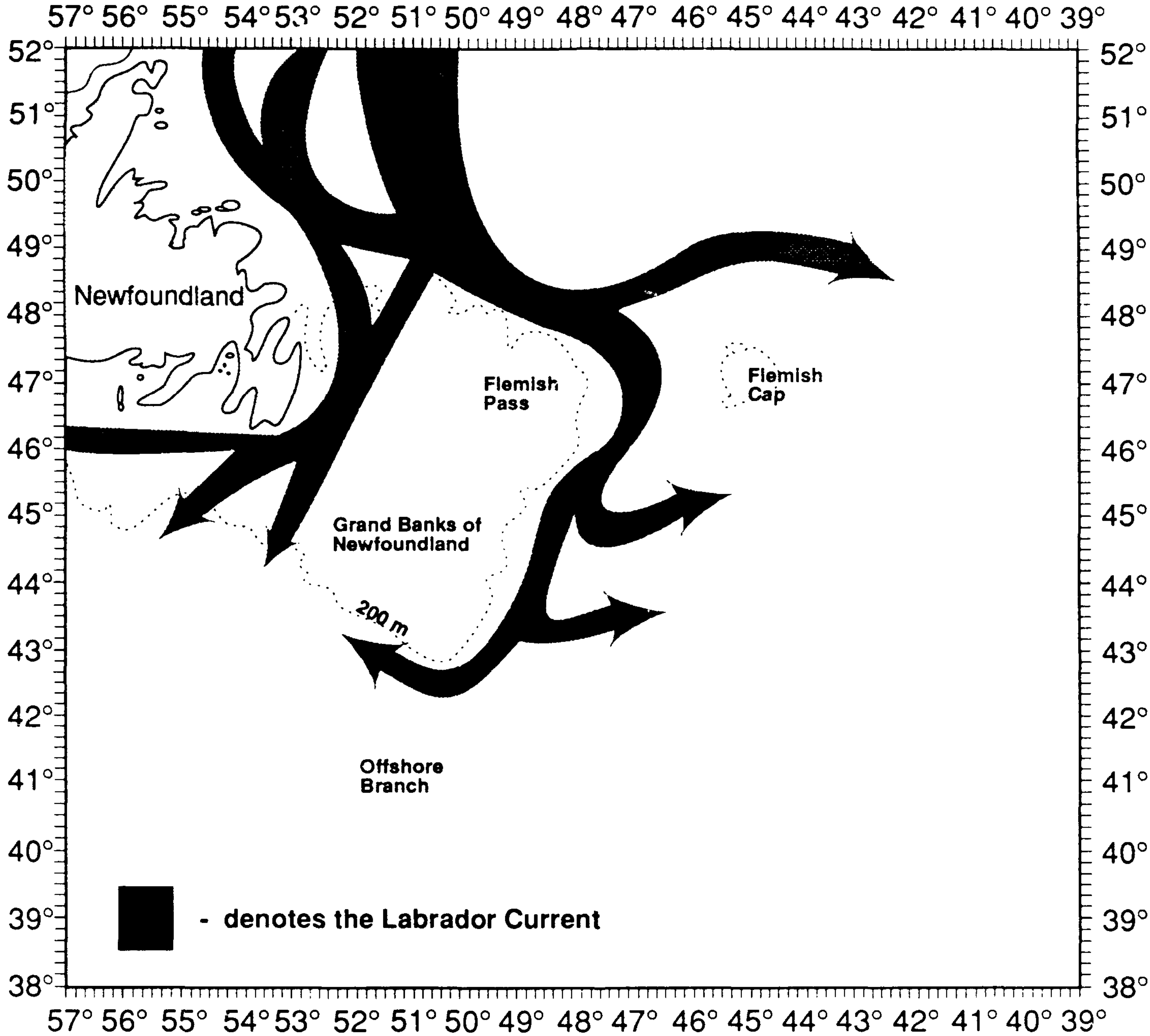


Figure 2: This figure depicts the Labrador Current, the main mechanism for transporting icebergs South to the Grand Banks.

Canada, and information on the mean sea ice extent was obtained from Ice Limits Eastern Canadian Seaboard, Ice Centre Ottawa, Atmospheric Environment Service, 1989. Figures 3 to 14 compare sea ice extents during the 1991 IIP year to mean sea ice extents. Environmental information was obtained from the Mariner's Weather Log and AES Thirty Day Ice Forecasts. Figures 15-28 show the IIP Limits of All Known Ice and the sea ice edge for the 15th and 30th of each month of the ice season.

During January and February the Icelandic Low was more intense than normal, and winds were westerly. The mean air temperatures for Newfoundland and Labrador were significantly (up to 6.8°C) below normal, and the freezing degree day accumulations were up to 40% greater than normal. The resulting sea ice extent was much greater than normal to the South and East (Figures 6 and 7) and was about one month ahead of normal. There were 20 new icebergs south of 48N in February, and the IIP Limits of All Known Ice (LAKI) reached 43N (Figures 15 and 16).

During March, the Icelandic Low was still lower than normal, and the prevailing windflow was from the northeast. Although the monthly mean temperature was slightly above normal, the freezing degree day accumulations were much greater than normal. SST charts for March show that a tongue of the cold (0°C) Labrador Current extended south to 41°N during the month. This and the northeasterly winds resulted in a sea ice extent greater than normal to the south with less than normal eastward extent (Figure 8). There were 115 new bergs south of 48°N. By the end of March the LAKI extended below 41N and to 39W (Figure 18).

During April and May mean temperatures were again colder than normal, and winds were from a northerly direction. The sea ice extent was greater than normal to the south and east (Figures 9 and 10) but began to retreat slowly to the north. 138 and 283 new icebergs were south of 48°N during April and May, respectively. By April 15, the LAKI covered a large portion of the IIP operating area, extending beyond the eastern border of the IIP area (Figure19).

During June and July mean temperatures were still well below normal, and mean windflow was from west to northwest. The sea ice extent was greater than normal, and the westerly winds kept the ice off the shore (Figures 11 and 12). Ice melt was very slow, and thick and old ice persisted along most of the Labrador coast during July - the first time this has been recorded. There were an incredible 1021 new bergs south of 48°N in June, and 355 in July. Figures 23-26 show that the LAKI were extensive late in the season and were still below 41N at the end of July.

During August northwesterly winds prevailed, and temperatures were near normal. During September, there was a southerly windflow, and temperatures were about 2°C above normal. The sea ice receded out of the IIP area by mid August. There were 75 new bergs south of 48°N in August, and only 1 in September. The LAKI also receeded, and the season was closed on August 24.

In summary, 1991 was an extreme ice year based on the number of icebergs (2008) south of 48°N. 1991 had the second highest total on record. Lasting 183 days, it was also one of the longest seasons. The greater than normal sea ice conditions throughout the season protected icebergs from deterioration longer, and when it did finally recede icebergs were released farther to the south than normal. Sea surface temperature (SST) charts show that the cold (less than 6°C) Labrador Current water extended south beyond the tail of the Grand Banks to about 42°N until August, which was longer than normal. This southward extent of the colder water occurred because a southward meander in the Gulf Stream existed below the Grand Banks throughout the

season, allowing the Labrador Current to push further south. Although the southern extent of this water was not as great as that of the tongue of cold water which reached 39°N during May of the previous season, the cold water remained south of the Grand Banks much longer this year. This persistent cold water and the greater than normal sea ice extent were the main contributors to this extreme season. Also note (Table 2) that the season peaked later than usual, with June rather than April having the most new icebergs south of 48°N.

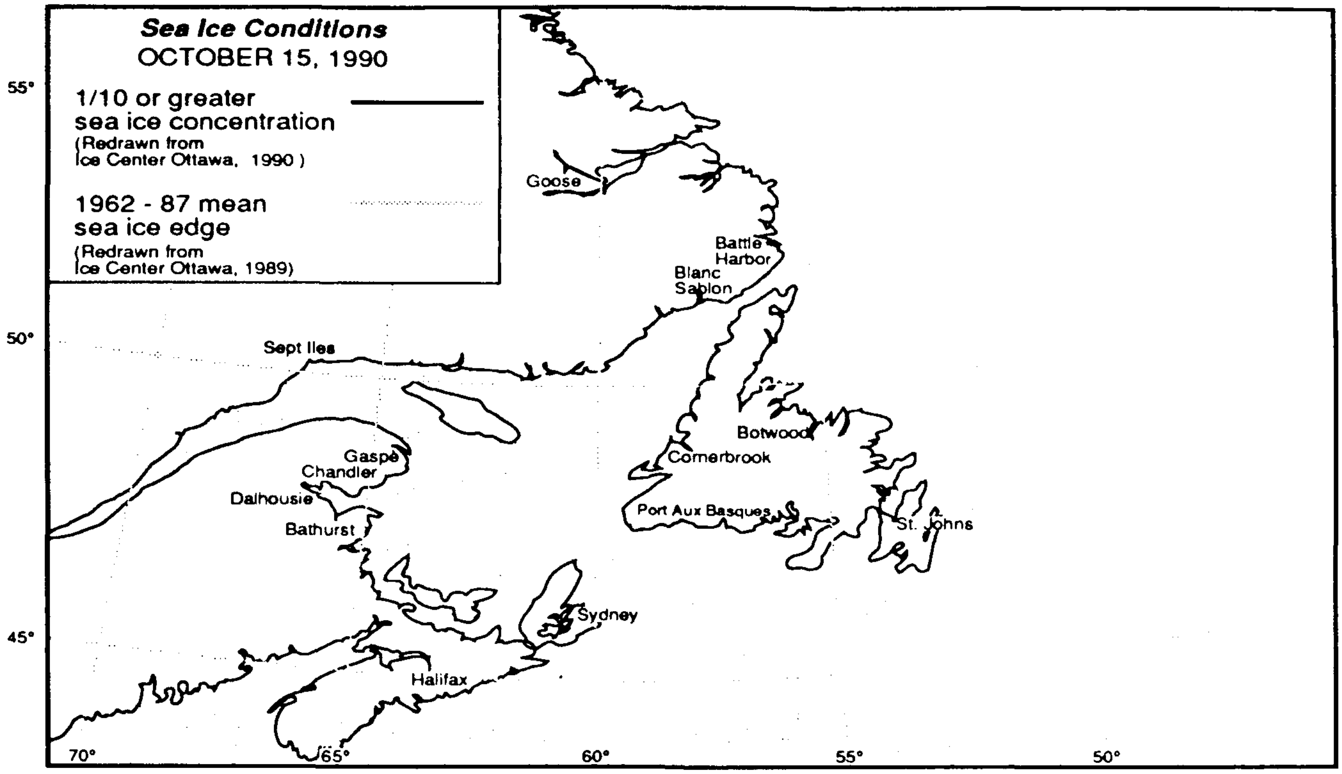
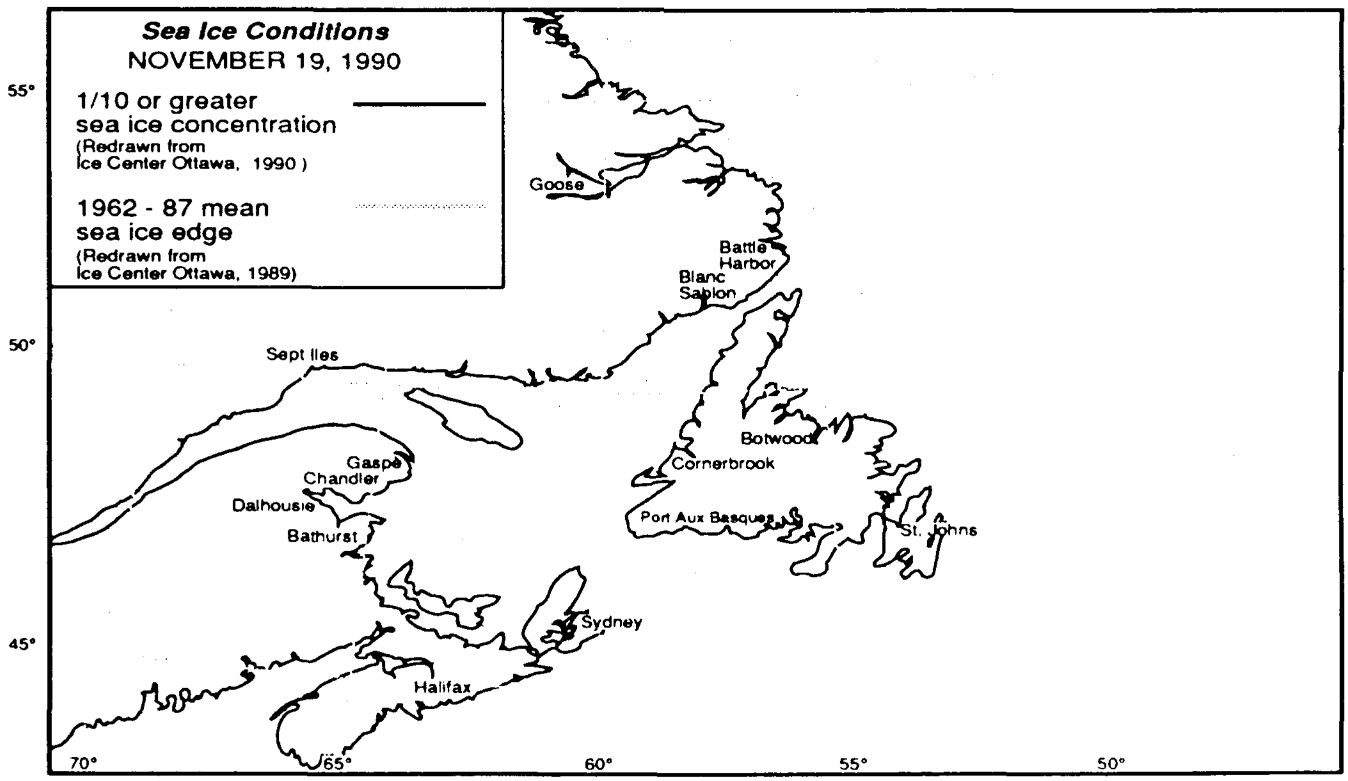


Figure 3



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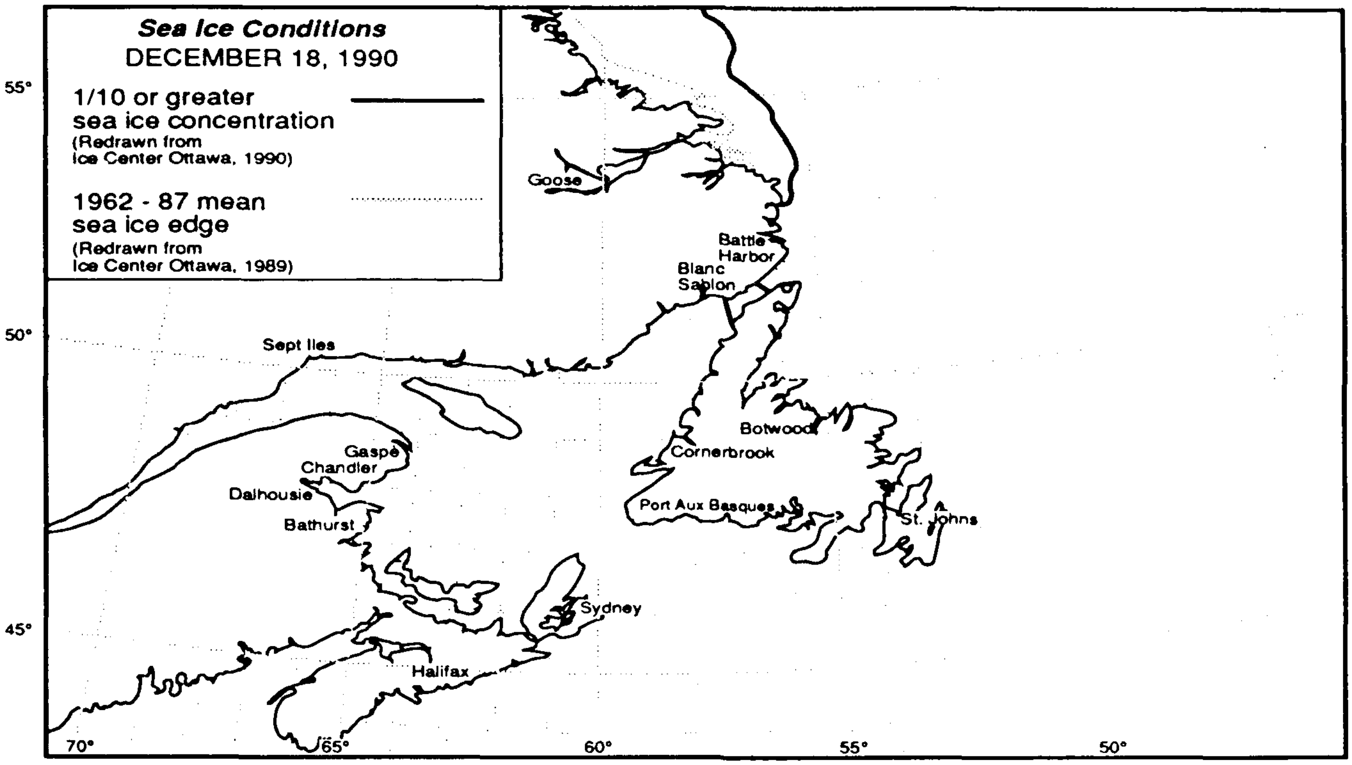

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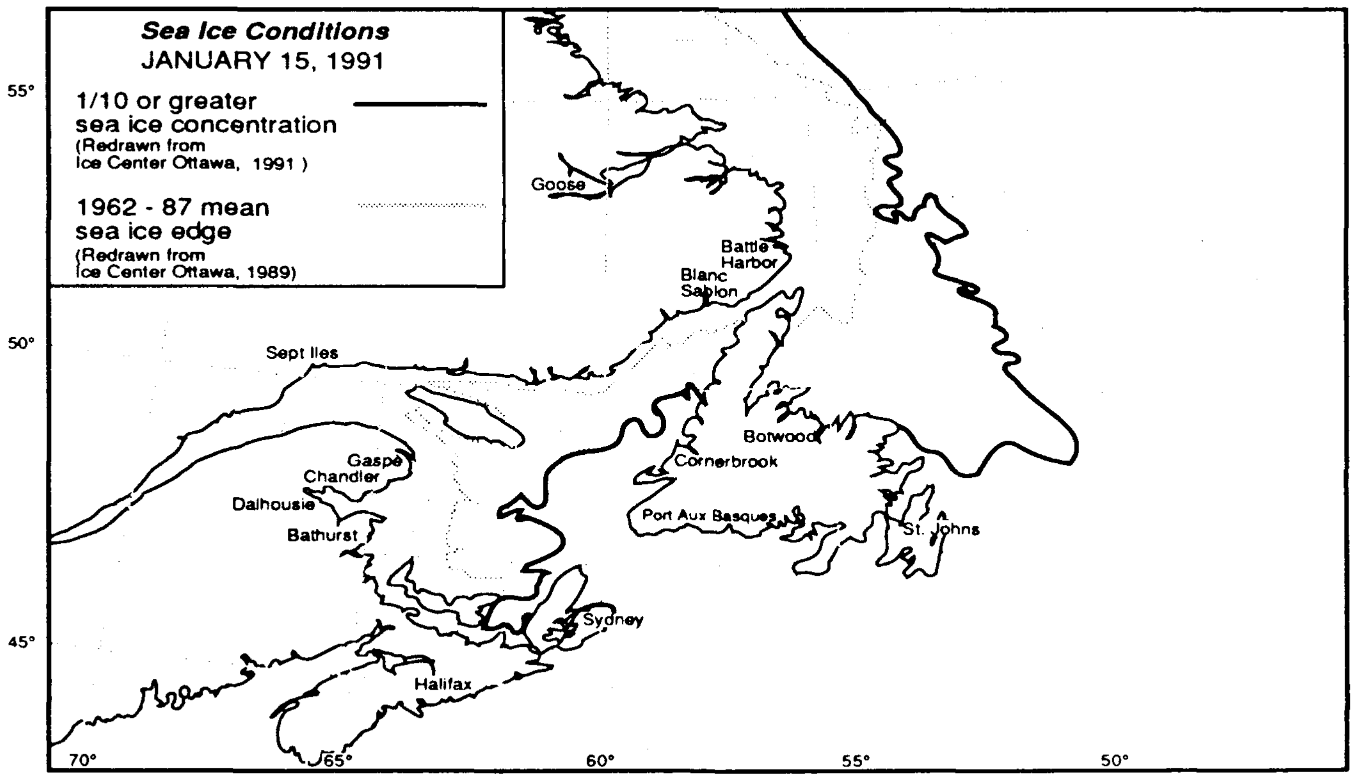

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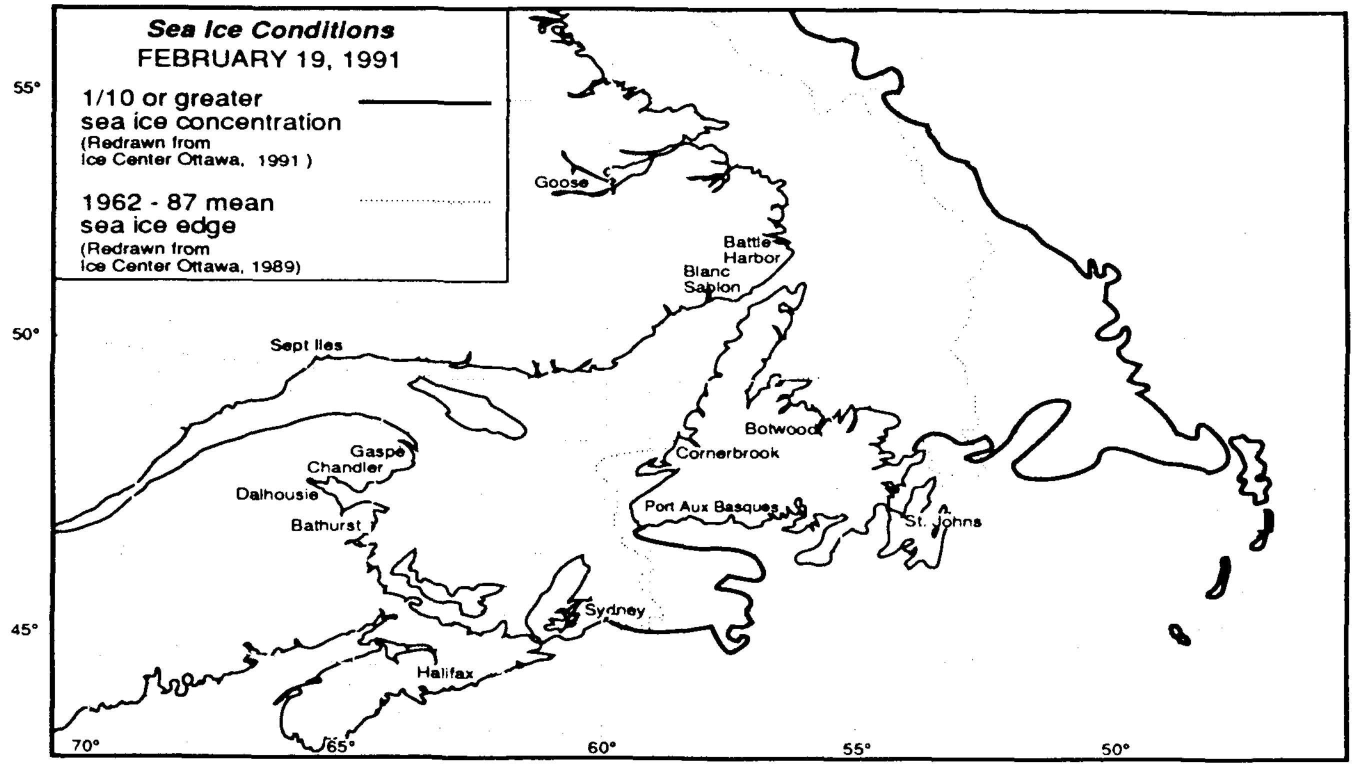

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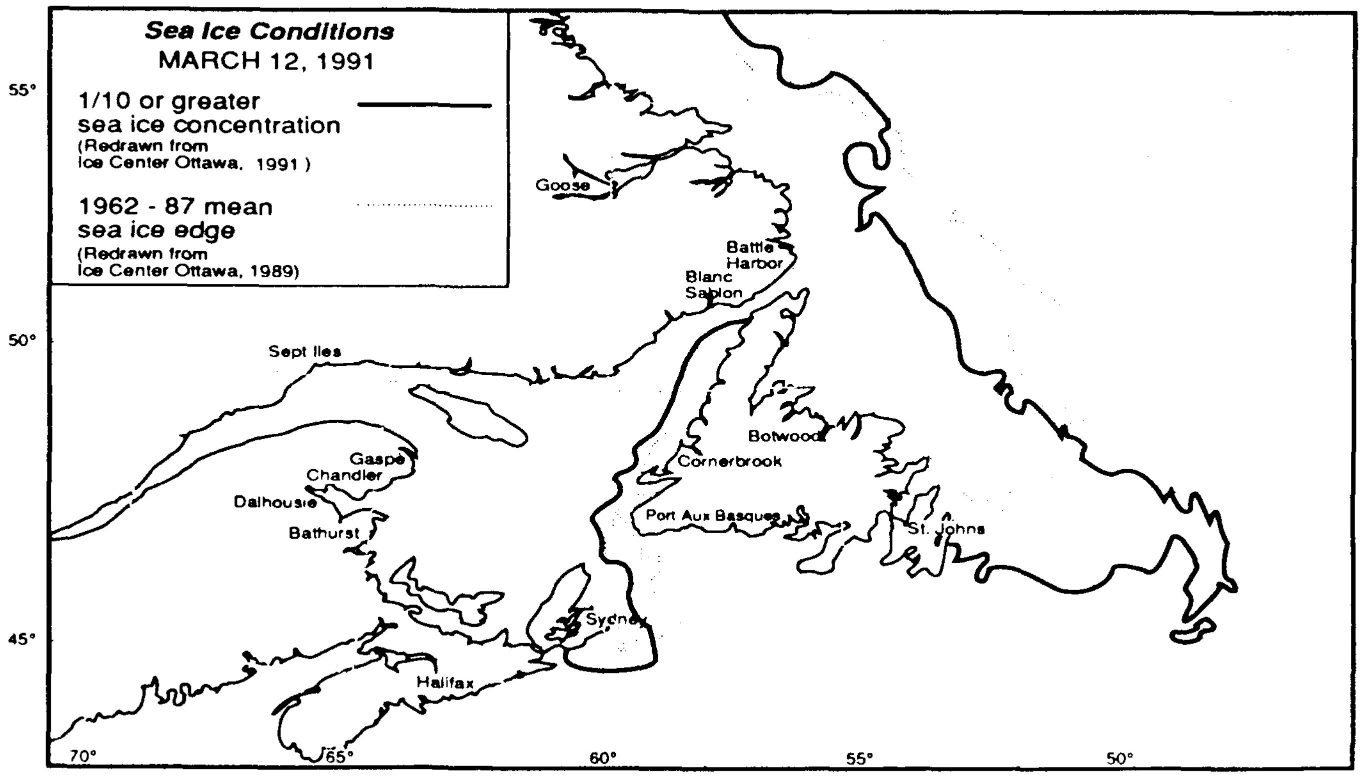

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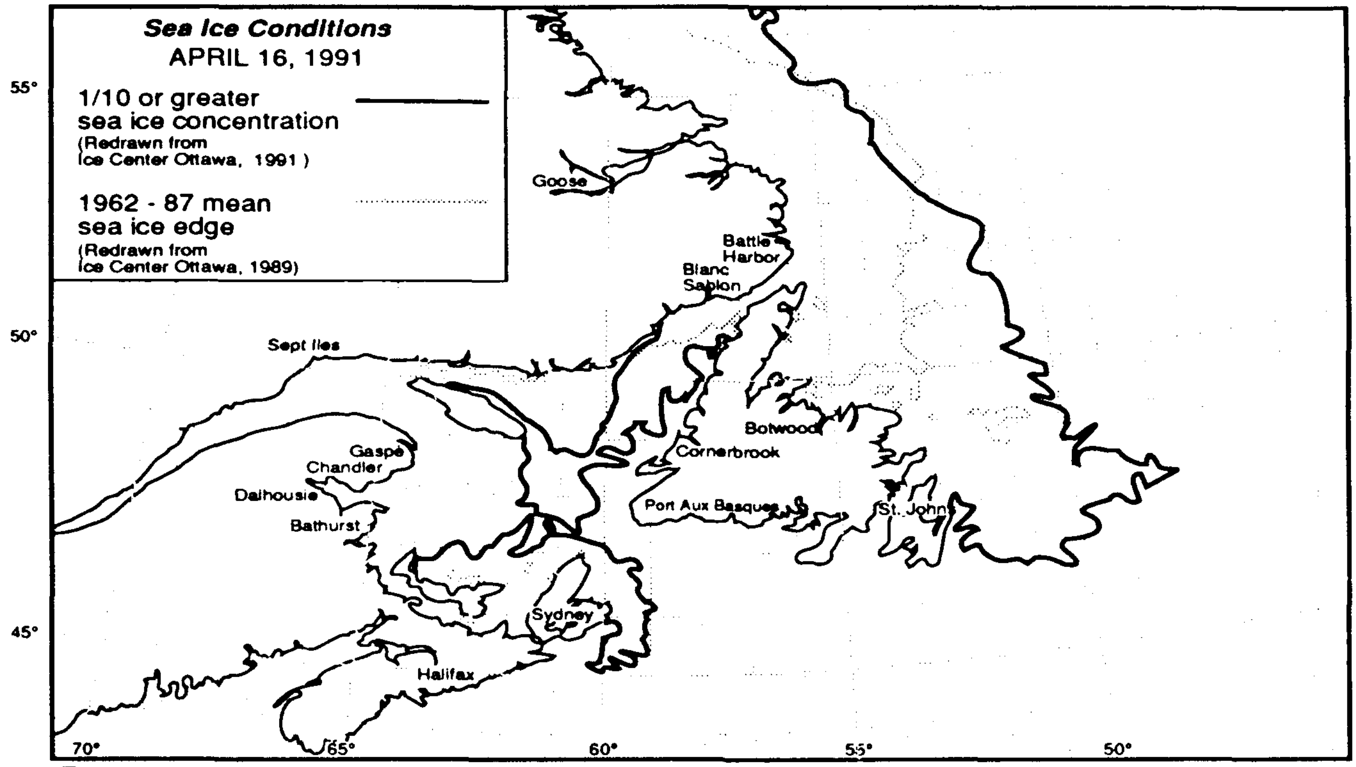

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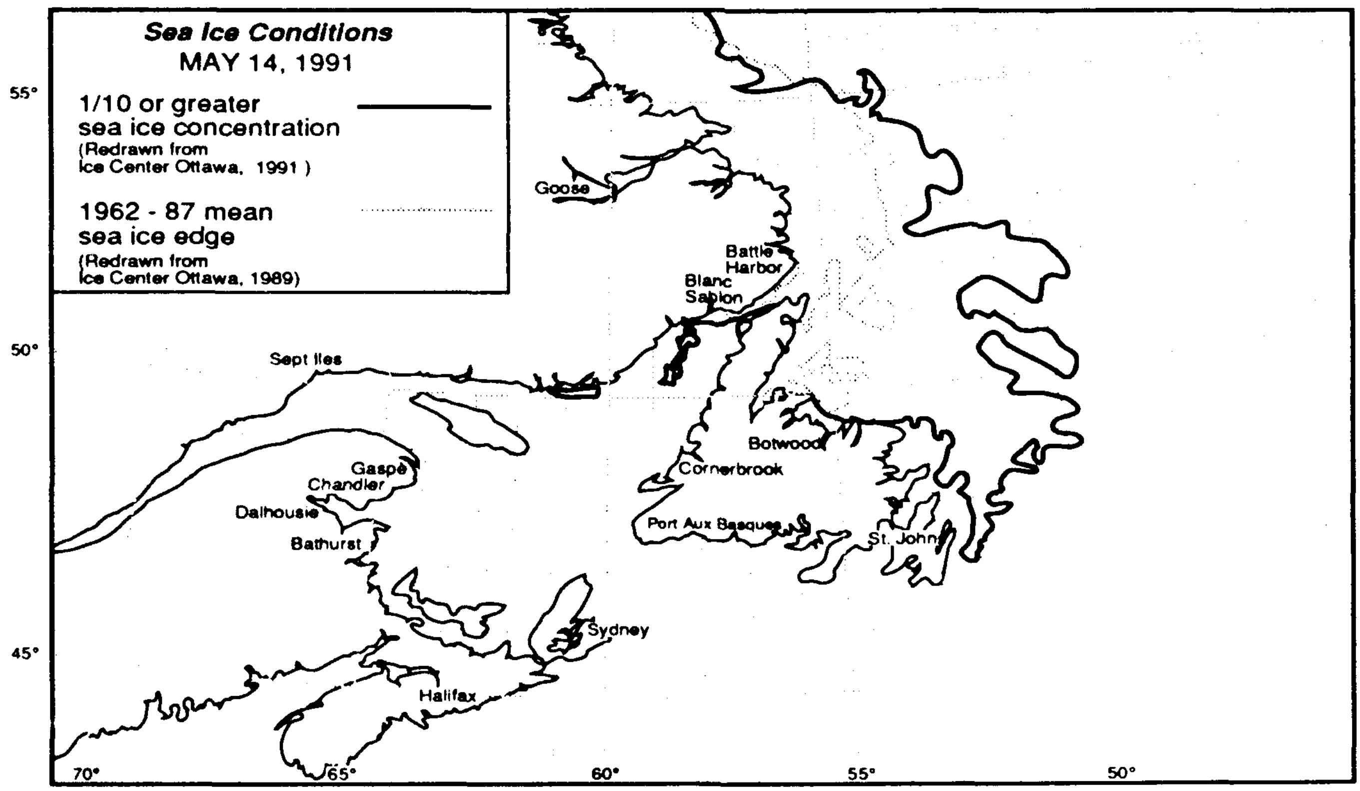


Figure 10

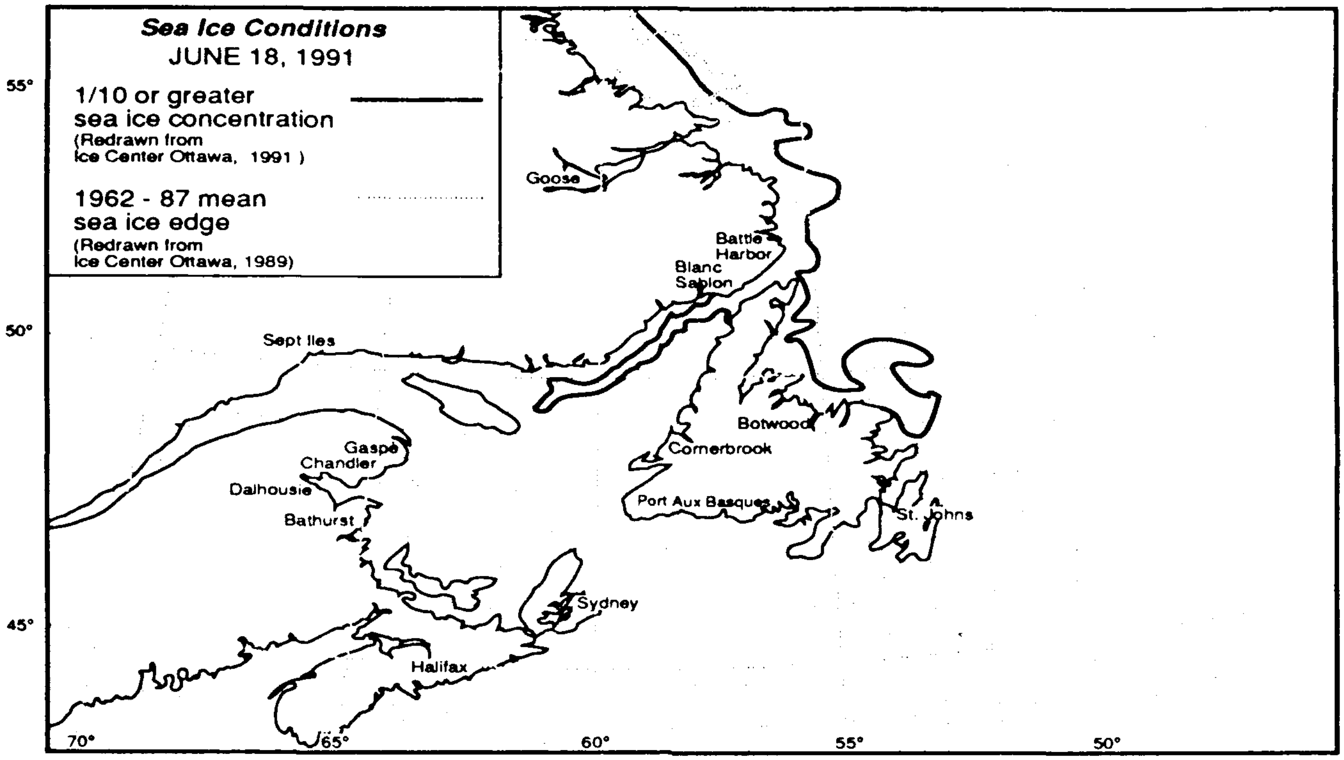


Figure 11

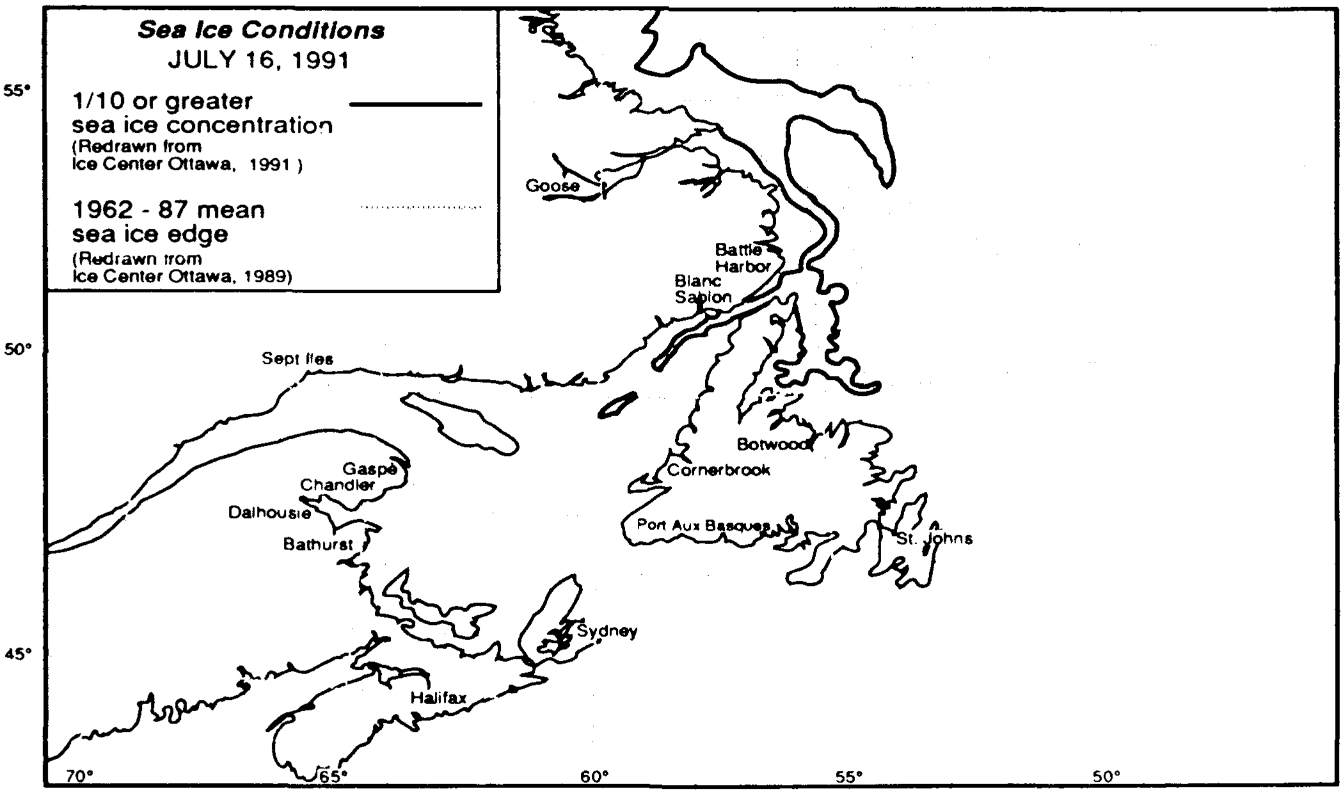
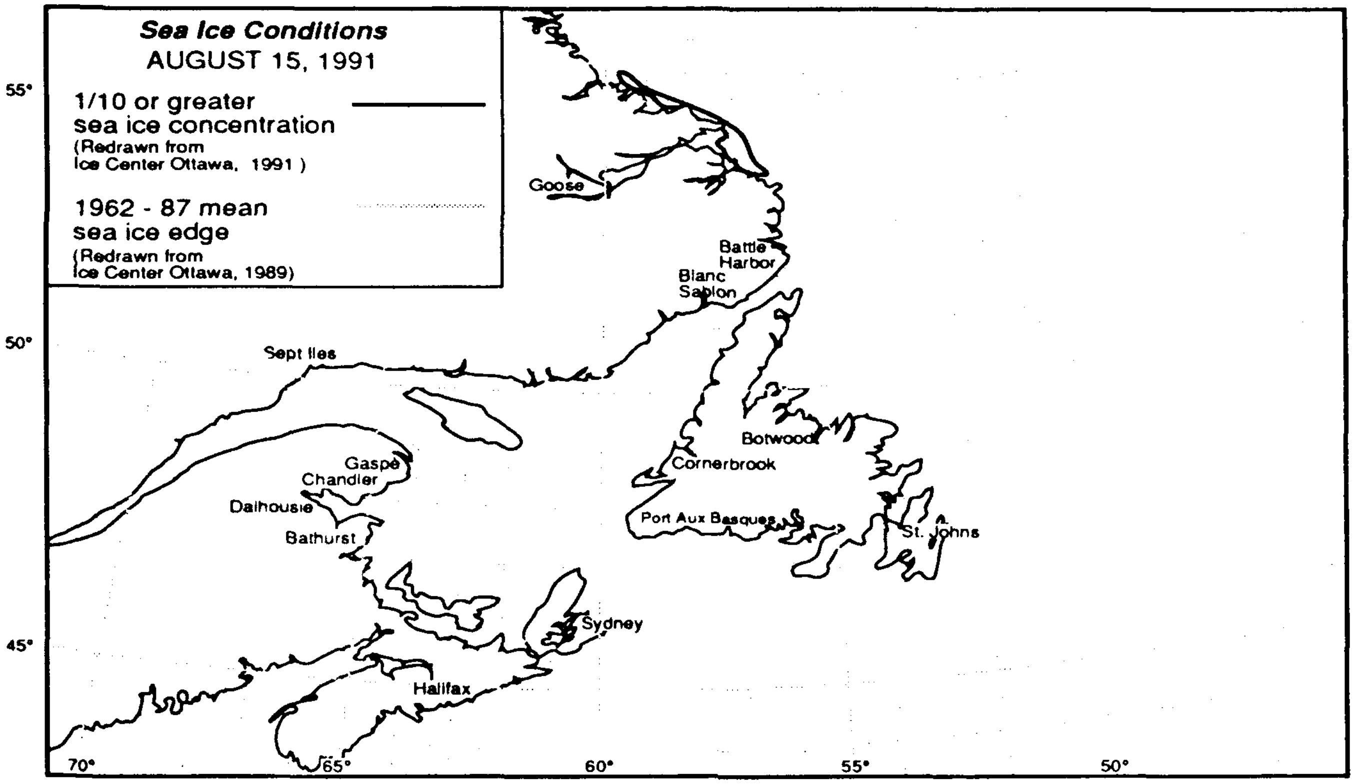


Figure 12



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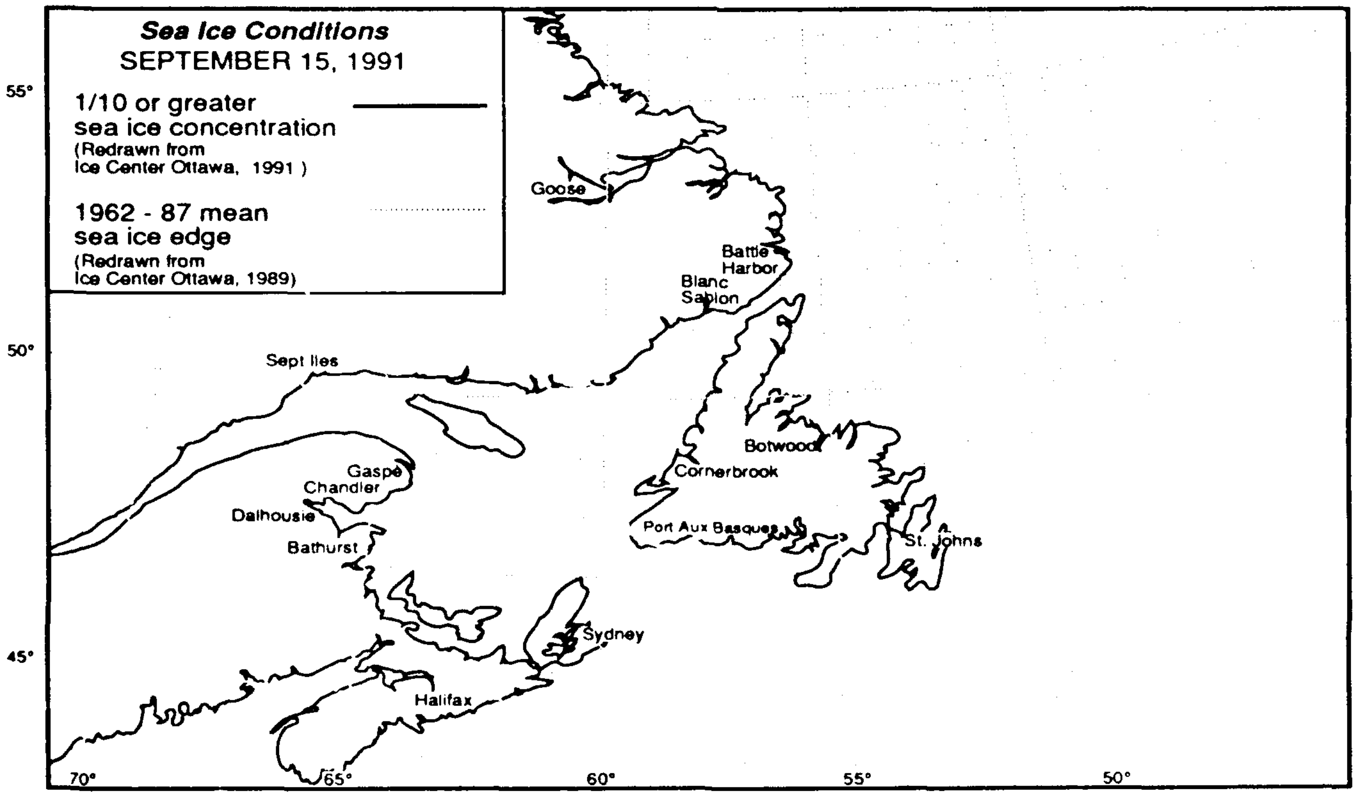

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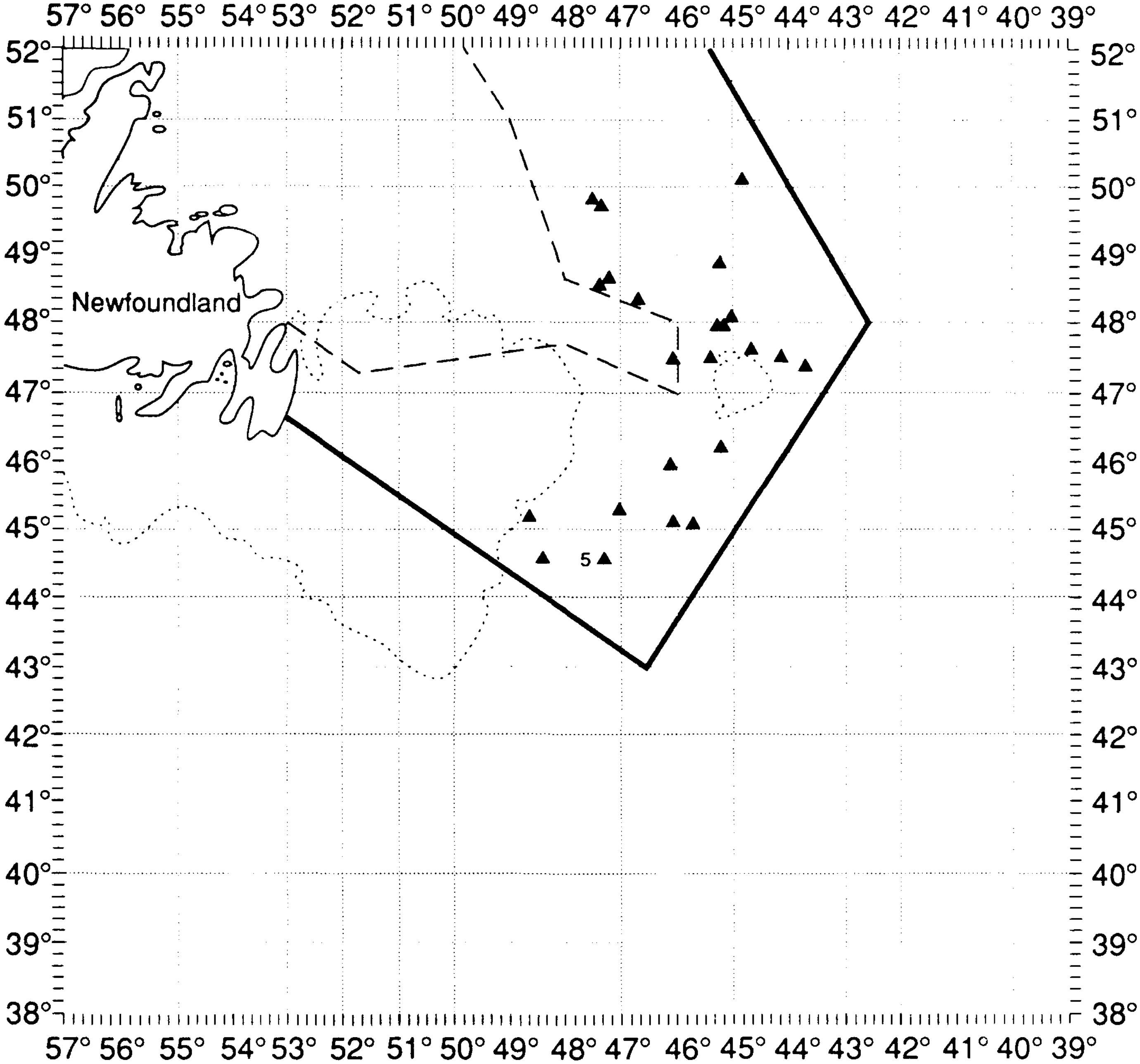


N ▲ Berg

N ▲ Growler

N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

——— Estimated limit of all known ice

– – – – Estimated limit of sea ice

·········· 200 Meter bathymetric curve

Figure 15. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 23 Feb 91 Based On Observed And Forecast Conditions

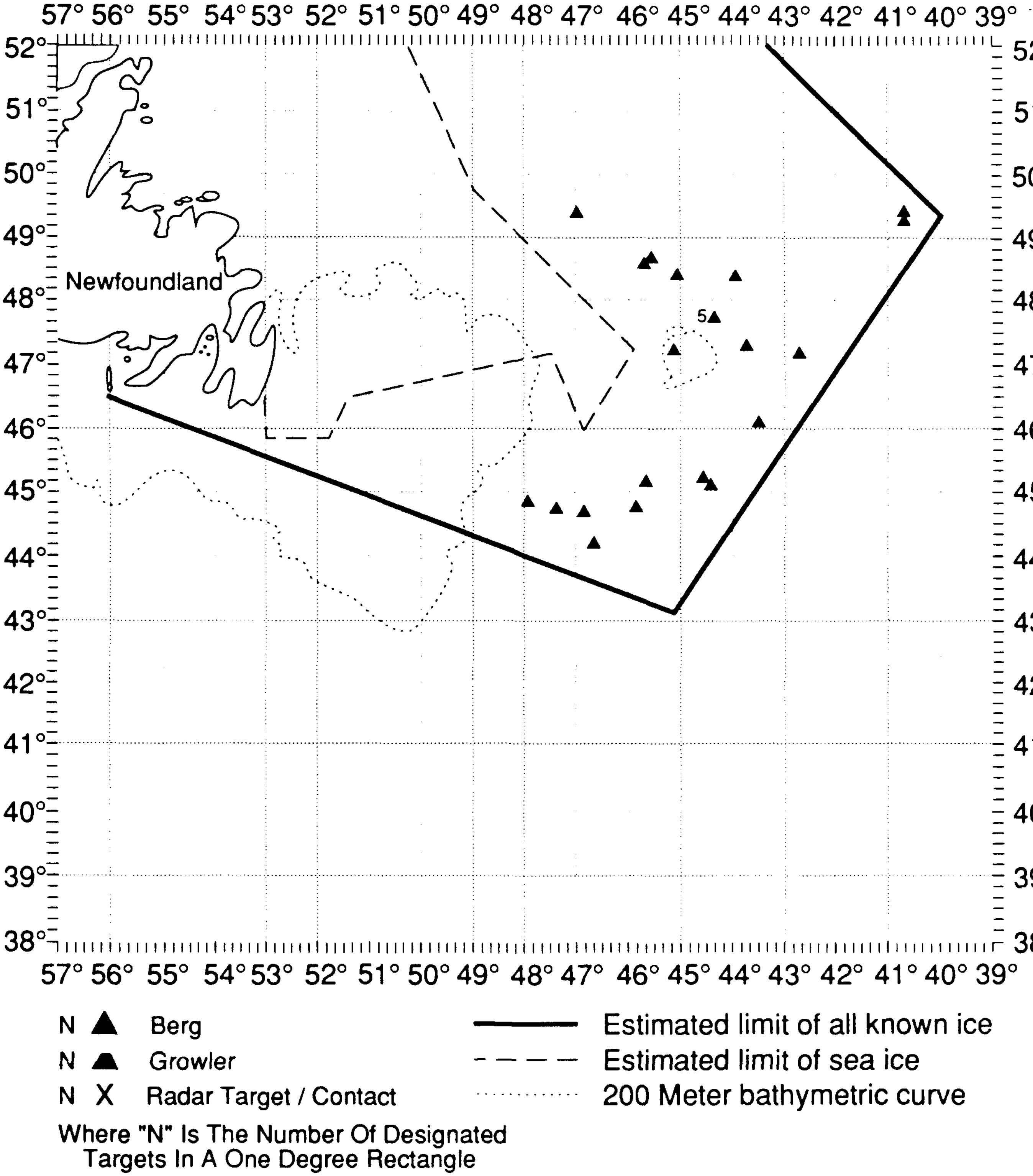


Figure 16. Graphic Depiction Of International Ice Patrol Ice Plot
For 1200 GMT 28 Feb 91 Based On Observed And Forecast Conditions

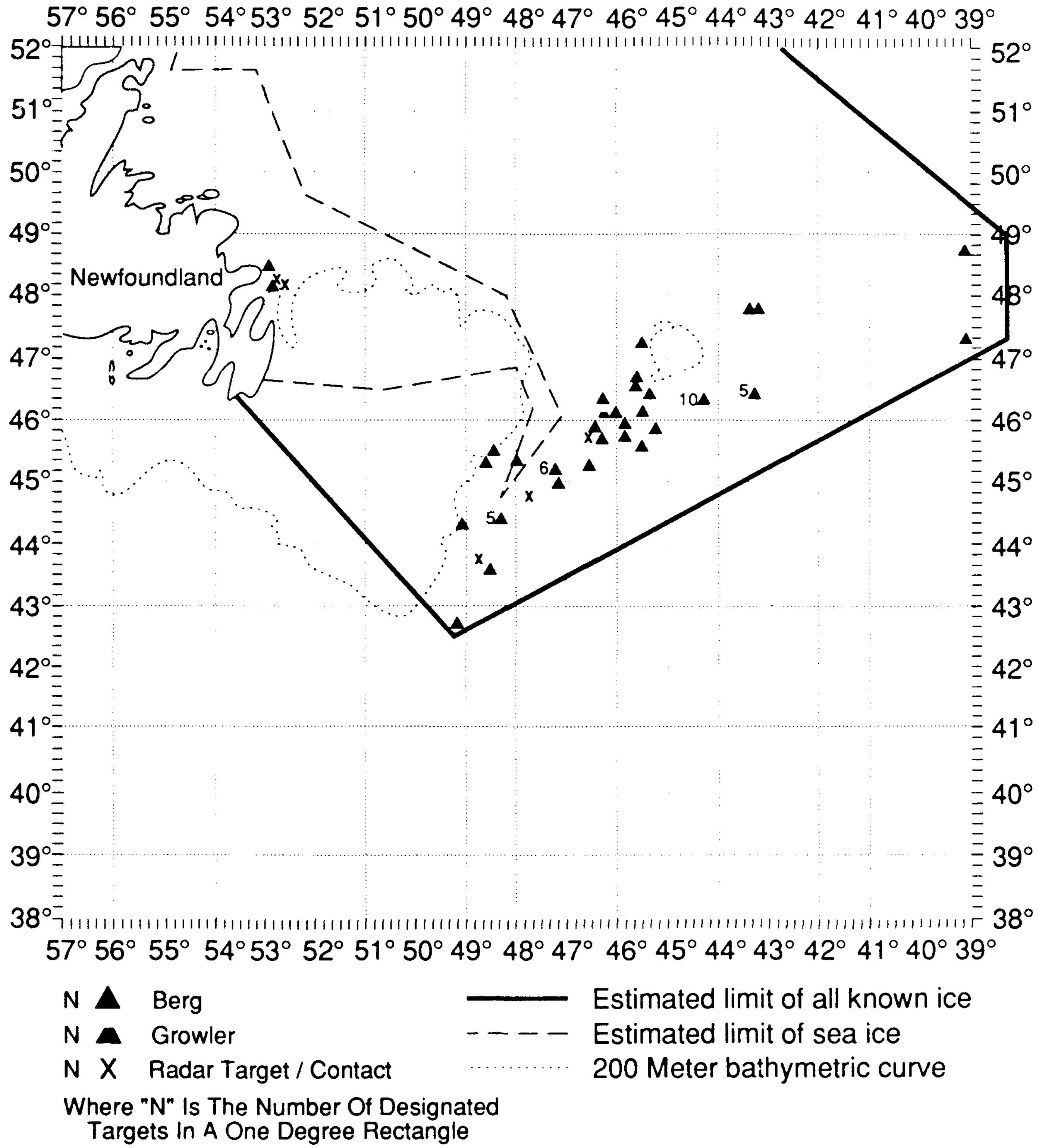


Figure 17. Graphic Depiction Of International Ice Patrol Ice Plot
For 1200 GMT 15 Mar 91 Based On Observed And Forecast Conditions

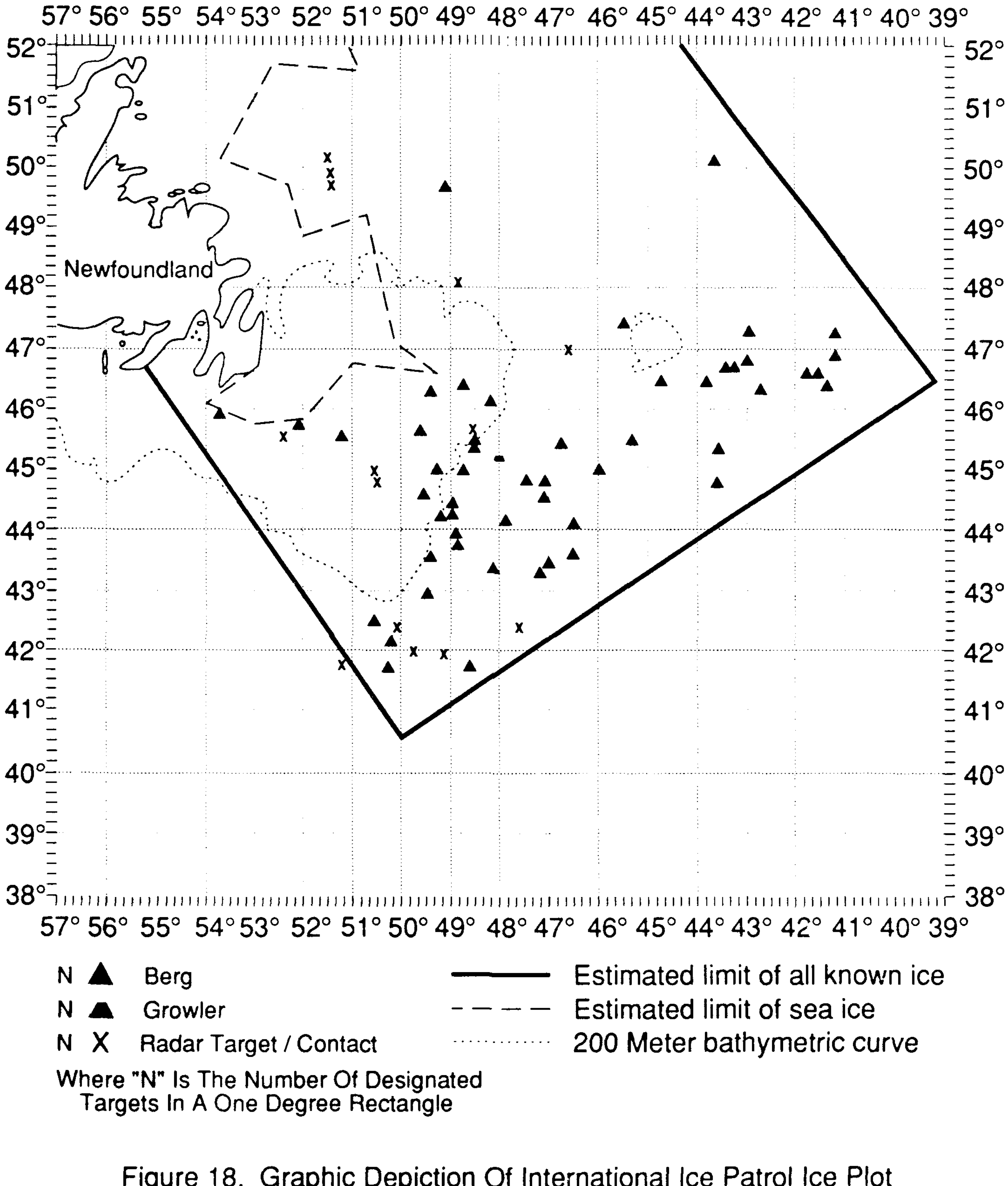


Figure 18. Graphic Depiction Of International Ice Patrol Ice Plot
For 1200 GMT 30 Mar 91 Based On Observed And Forecast Conditions

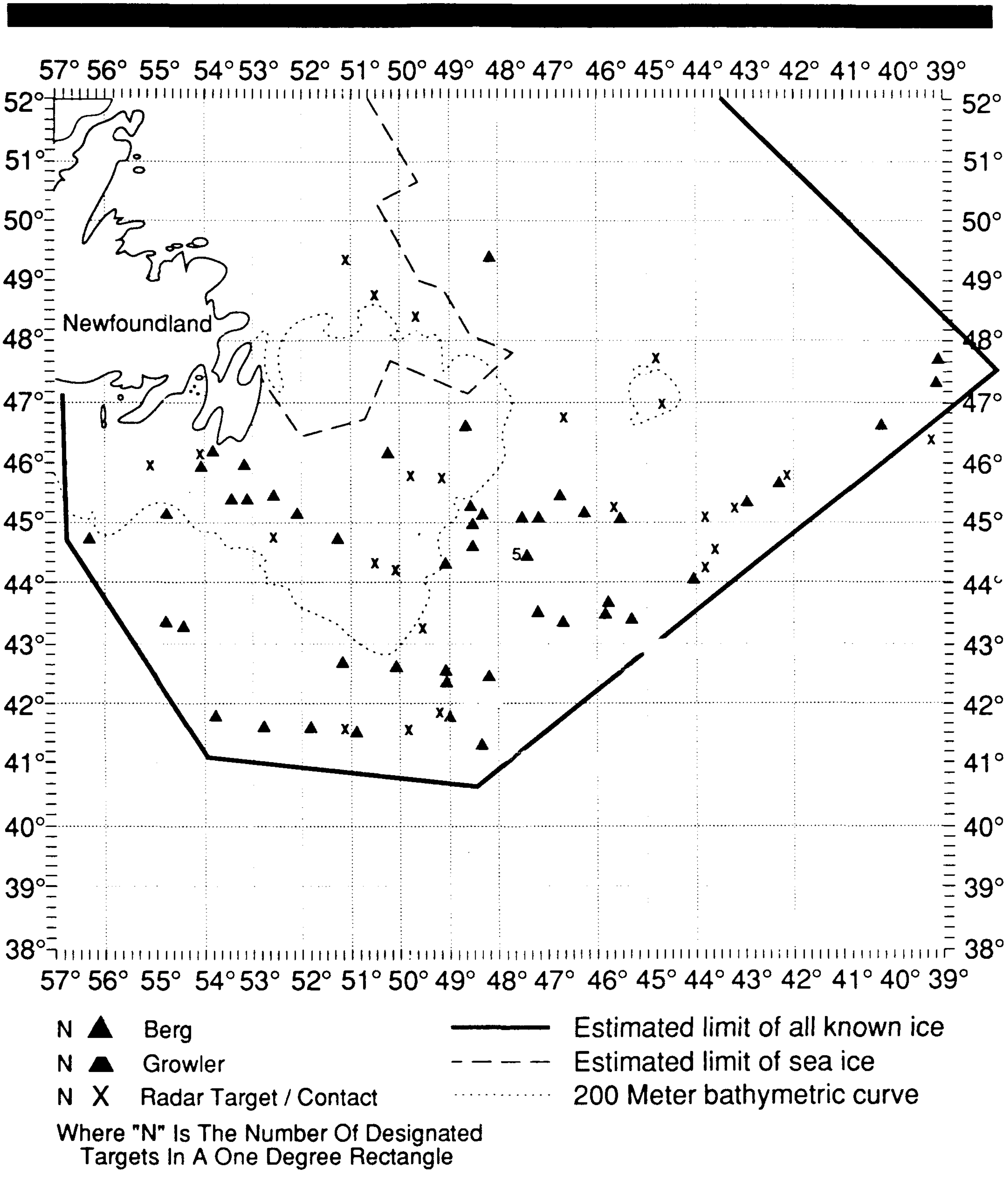


Figure 19. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 15 Apr 91 Based On Observed And Forecast Conditions

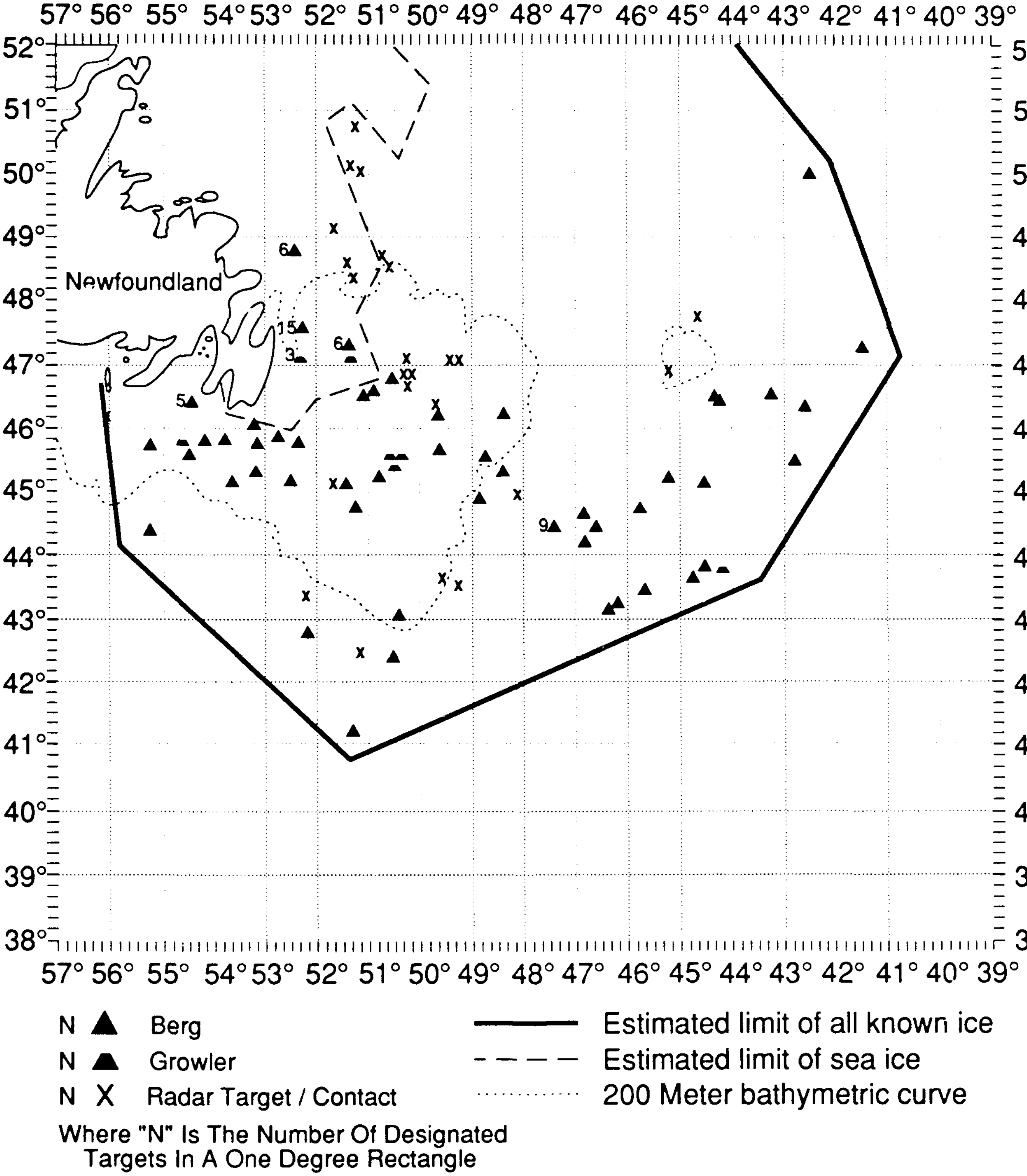
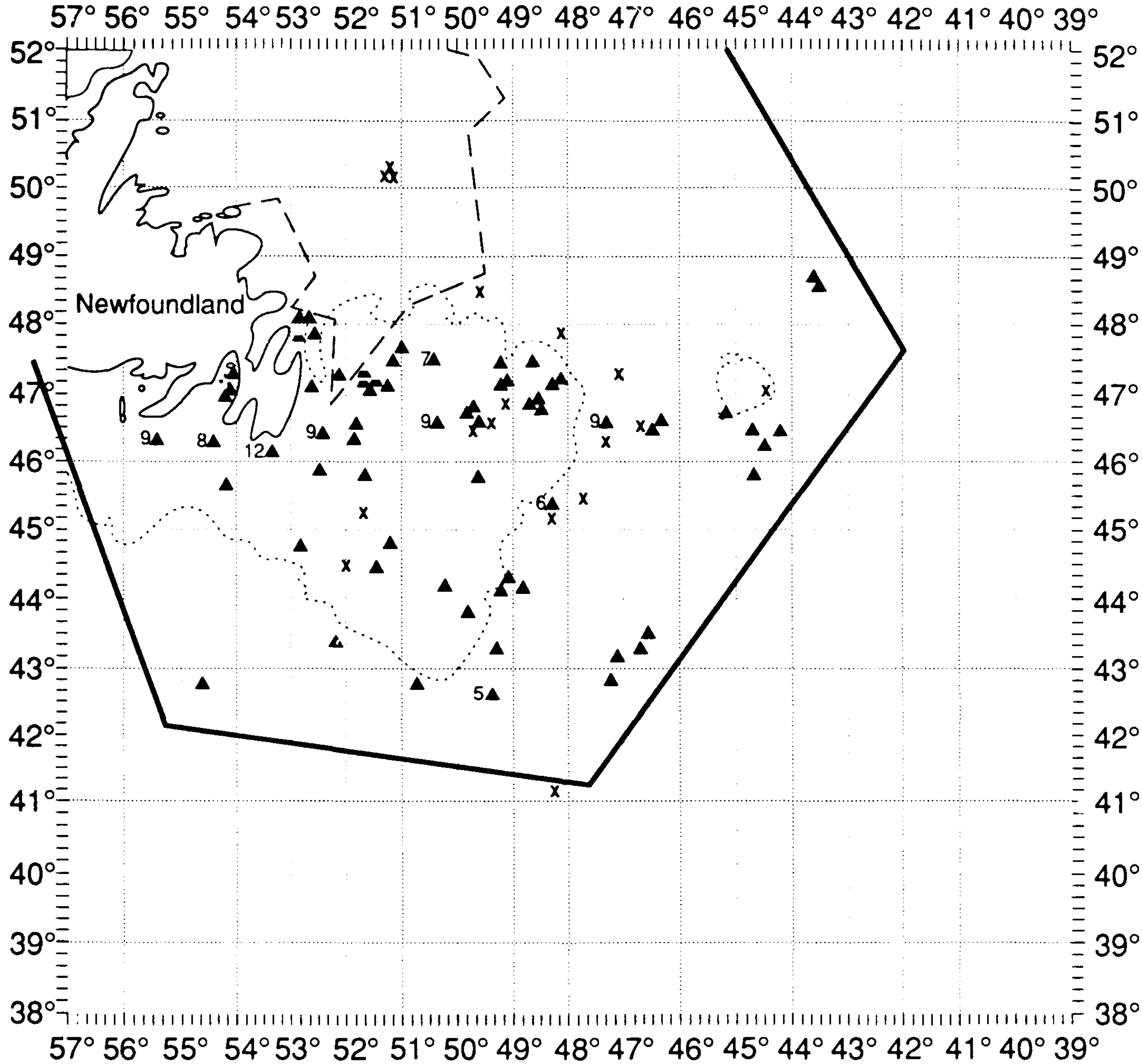


Figure 20. Graphic Depiction Of International Ice Patrol Ice Plot
For 1200 GMT 30 Apr 91 Based On Observed And Forecast Conditions



N ▲ Berg
N ▲ Growler
N X Radar Target / Contact
Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

——— Estimated limit of all known ice
– – – – Estimated limit of sea ice
·········· 200 Meter bathymetric curve

Figure 21. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 15 May 91 Based On Observed And Forecast Conditions

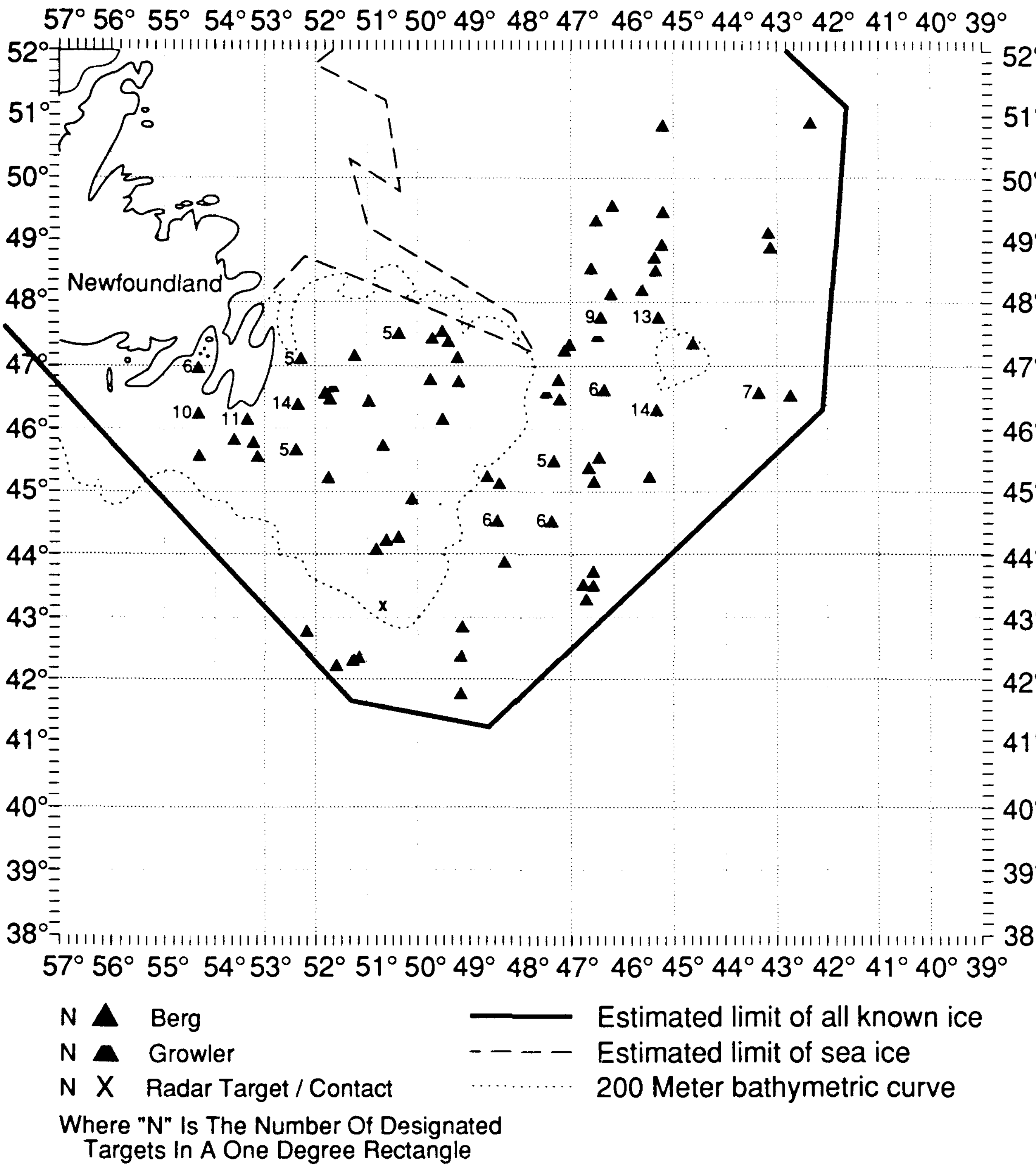
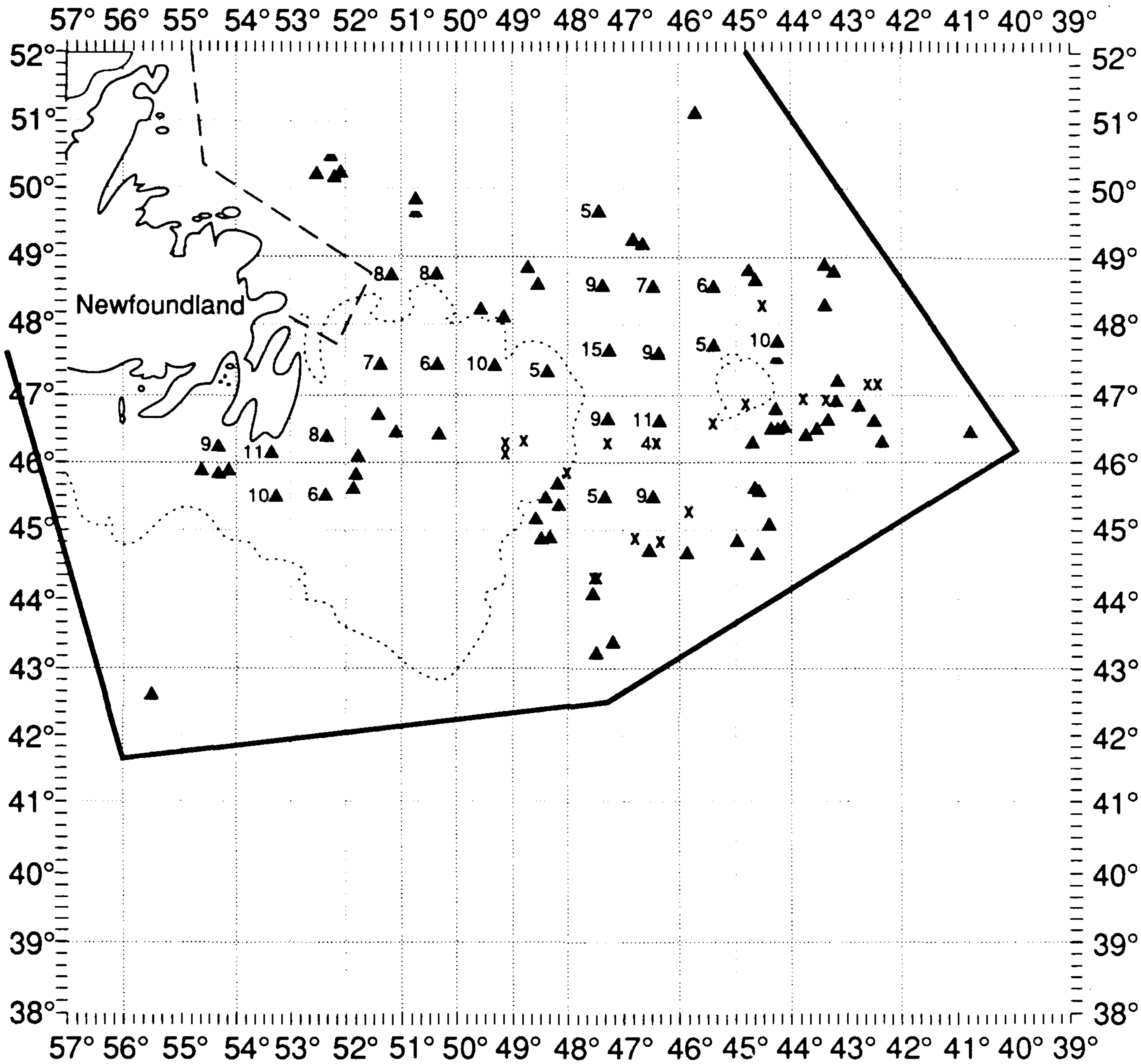


Figure 22. Graphic Depiction Of International Ice Patrol Ice Plot
For 1200 GMT 30 May 91 Based On Observed And Forecast Conditions



N ▲ Berg
N ▲ Growler
N X Radar Target / Contact
Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

Estimated limit of all known ice
Estimated limit of sea ice
200 Meter bathymetric curve

Figure 23. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 15 Jun 91 Based On Observed And Forecast Conditions

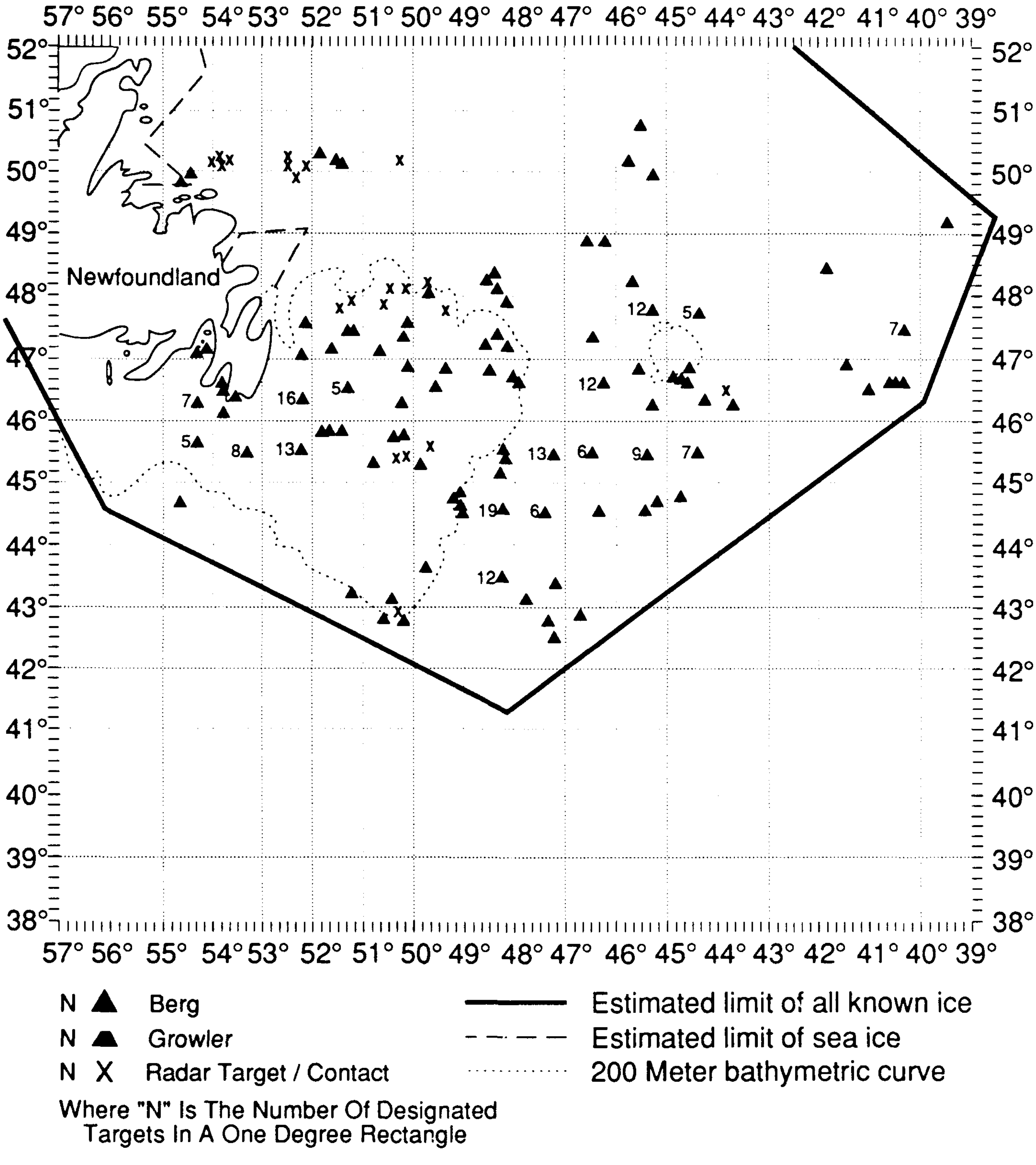
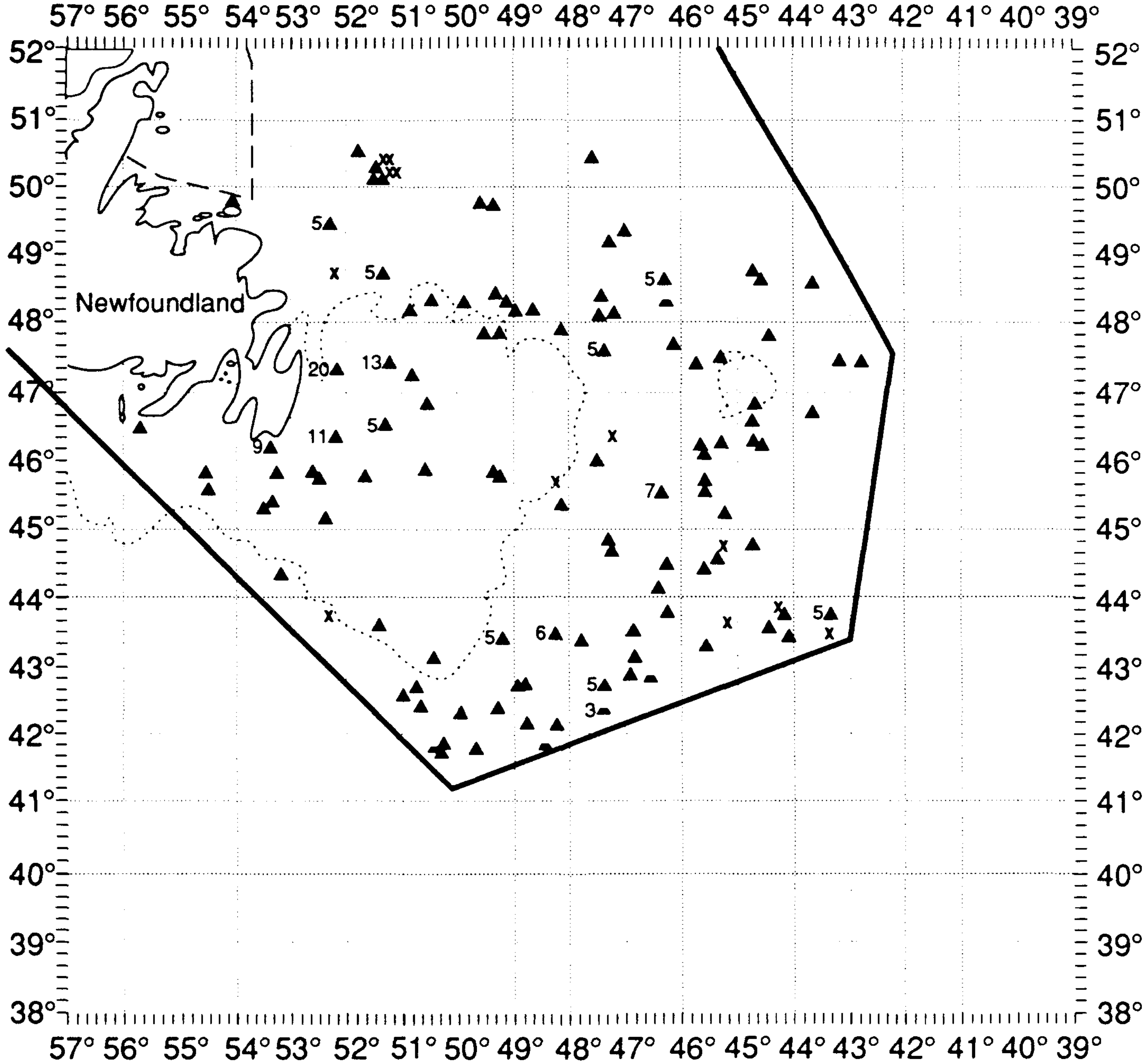


Figure 24. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 30 Jun 91 Based On Observed And Forecast Conditions

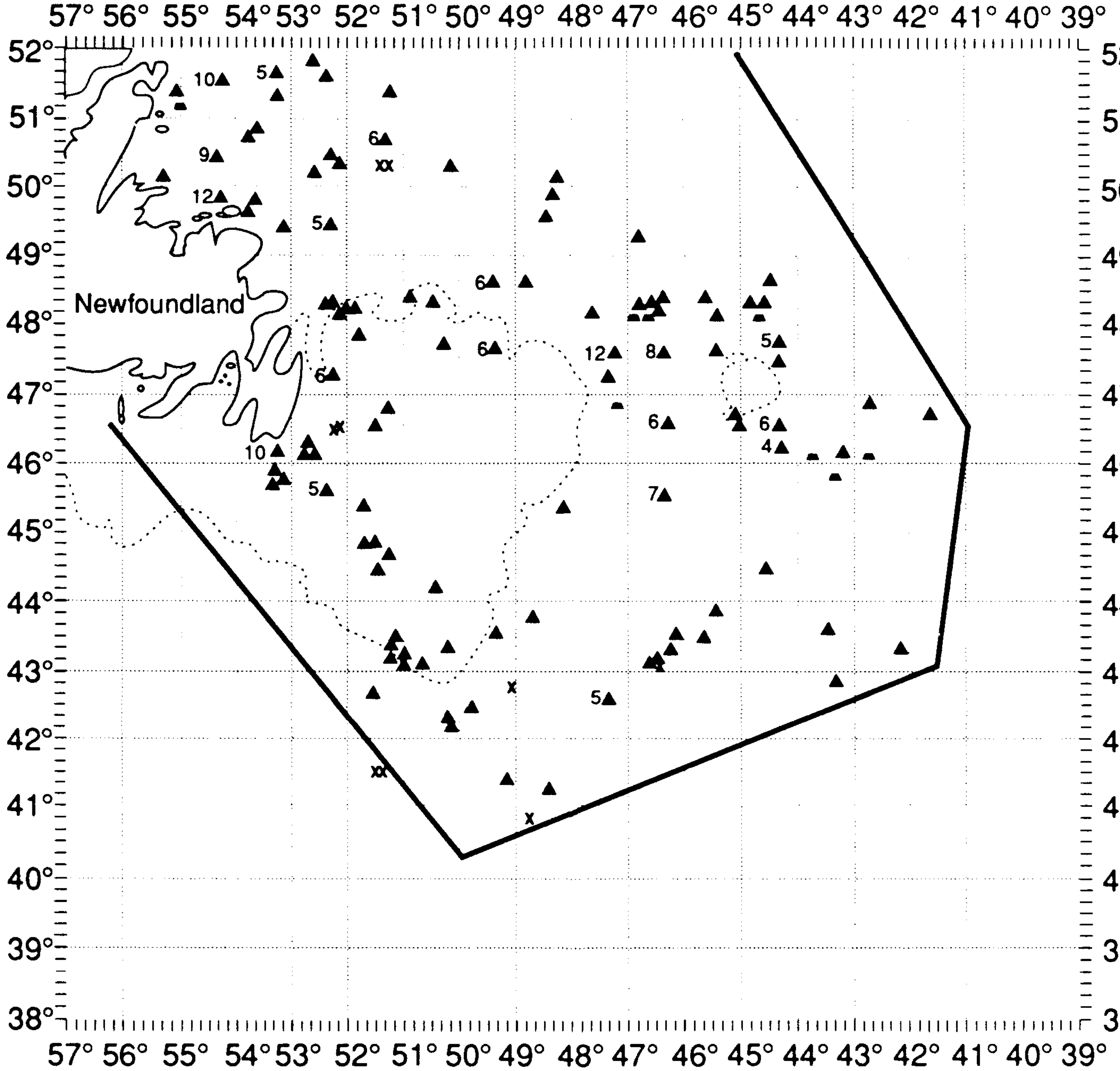


N ▲ Berg
N ▲ Growler
N X Radar Target / Contact

Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

——— Estimated limit of all known ice
– – – – Estimated limit of sea ice
·········· 200 Meter bathymetric curve

Figure 25. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 15 Jul 91 Based On Observed And Forecast Conditions



N ▲ Berg
N ▲ Growler
N X Radar Target / Contact
Where "N" Is The Number Of Designated Targets In A One Degree Rectangle

——— Estimated limit of all known ice
– – – – Estimated limit of sea ice
·········· 200 Meter bathymetric curve

Figure 26. Graphic Depiction Of International Ice Patrol Ice Plot
For 1200 GMT 30 Jul 91 Based On Observed And Forecast Conditions

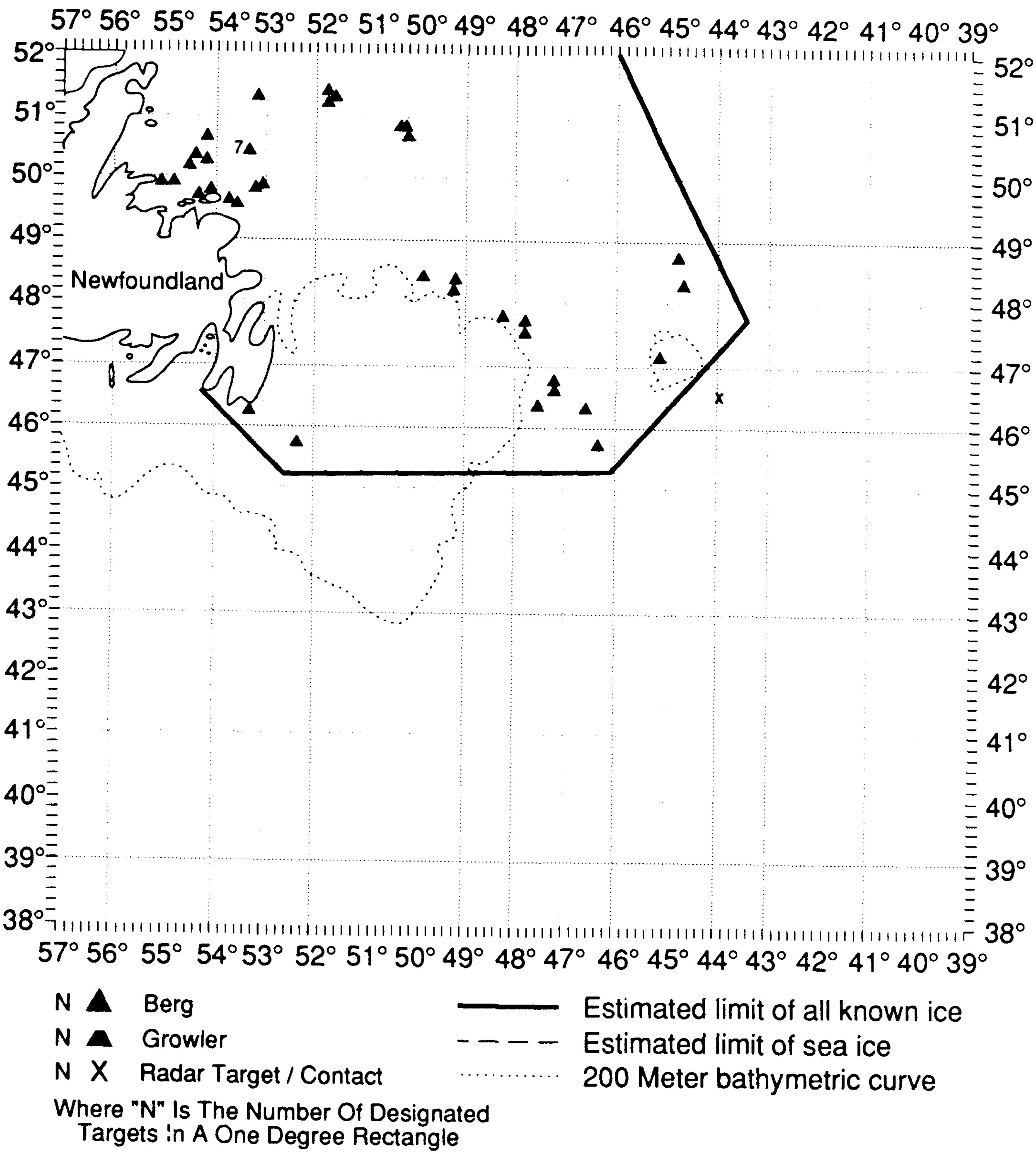


Figure 27. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 15 Aug 91 Based On Observed And Forecast Conditions

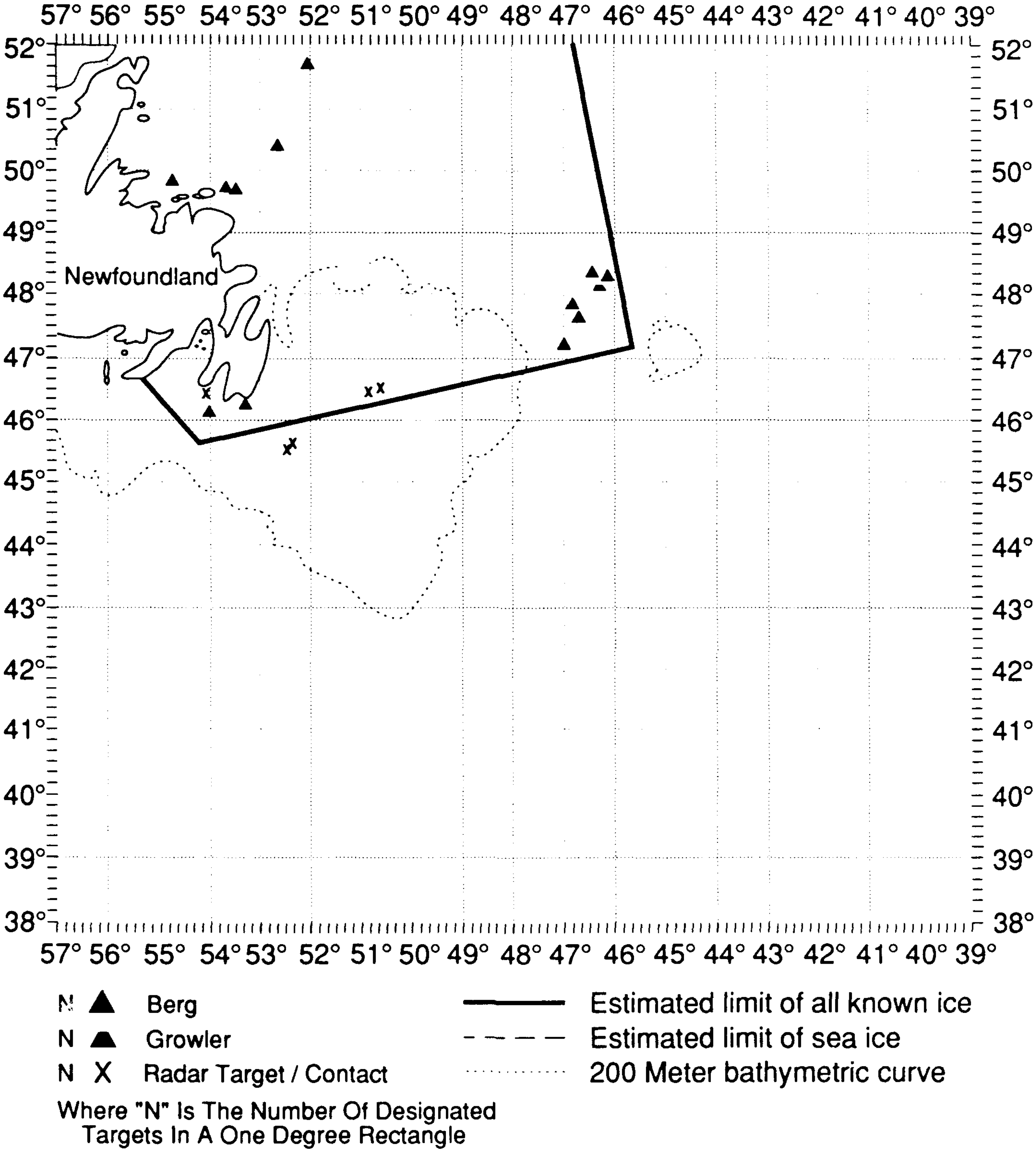


Figure 28. Graphic Depiction Of International Ice Patrol Ice Plot For 1200 GMT 24 Aug 91 Based On Observed And Forecast Conditions

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We extend our sincere appreciation to the staffs of the Canadian Coast Guard Radio Station St. John's, Newfoundland/VON, Ice Operation St John's, Newfoundland, Air Traffic Control Centers Gander, Newfoundland, and New York, Canadian Forces Gander and St John's, Newfoundland, the St. John's Weather Offices, and to the personnel of U.S. Coast Guard Air Station Elizabeth City, U.S. Coast Guard Air Station Cape Cod, and U.S. Coast Guard Communications Station Boston for their excellent support during the 1991 International Ice Patrol season.

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Appendix A
Ship Reports

VESSEL NAME	FLAG	SST	ICE REPORTS
ABITIBI CLAIBORNE	GERMANY		7
ABITIBI MACADO	GERMANY		6
ADA GORTHON	BAHAMAS		2
ADRIAN MAERSK	DENMARK		1
AEGIR	BURMA		6
AFRICAN GRDENIA	LIBERIA	1	2
AIME GAUDREAU	CANADA		2
AIVIK	CANADA		2
AKADEMIK SECHENOV	U. S. S. R.		1
AKMI	GREECE		1
AKOE	GREECE	2	2
ALBERTA	GREECE		1
ALDEN W. CLAUSEN	LIBERIA		1
ALEKSANDR STAROSTENKO	U. S. S. R.		3
ALEXITA	NORWAY		1
AMAZON	NORWAY		1
AMBER	PANAMA		1
AMELIA DESGAGNES	CANADA		1
AMULET	DENMARK	1	7
ANASTASIS	GREECE		1
ANDREW H	CYPRUS		1
ANGEL II	PANAMA		3
ANN HARVEY	CANADA		2
ANNA	ST. VINCENT GRENADIN		7
ANSGARITOR	GERMANY		1
AQUARIUS	ITALY		2
AQUILA	CYPRUS		1
ARAGON	GREECE		2
ARCADE EAGLE	NORWAY	5	1
ARCTIC	CANADA		1
ARCTIC SEA	DENMARK		4
ARCTIC VIKING	CANADA		3
ARI	LIBERIA	2	2
ARROW COMBINER	NORWAY		2
ASL SANDERLING	CANADA		2

SST = SEA SURFACE TEMPERATURE

VESSEL NAME	FLAG	SST	ICE REPORTS
ASTRAVALENTINA	ARGENTINE REPUBLIC		3
ATLANTA	MALTA		4
ATLANTIC CARTIER	FRANCE	1	2
ATLANTIC CLAIRE	CANADA		1
ATLANTIC CONVEYOR	UNITED KINGDOM		3
ATLANTIC LINK	NORWAY		6
ATLANTIC MARIE	CANADA		3
ATLANTIC MERCADO	CYPRESS	1	6
ATLANTIC PURSUIT	CANADA		4
ATLANTIC RUTHANN	CANADA		1
ATLANTIC TREASURE	CANADA		2
ATLANTICO	ITALY		1
AVIS FAITH	PANAMA		1
BAJA CALIFORNIA	PANAMA		1
BALLENITA	NORWAY		2
BALTASAR ALVARES	POLAND		1
BALTIC BREEZE	SINGAPORE		2
BALTIC SUN	NETHERLANDS		3
BALTIC TRADER	PHILLIPINES		4
BALTIYSKAYA SLAVA	U. S. S. R.		2
BANDAK	NORWAY	1	1
BARKEN	NETHERLANDS		1
BARRA HEAD	IRELAND		1
BARRY	NORWAY	4	1
BAY ROSE	CANADA		2
BEECO AMERICA	PANAMA	1	3
BERGE ADRIA	NORWAY	19	19
BERGE MASTER	NORWAY		1
BERGE ODEL	NORWAY		1
BERGEN	GERMANY		2
BERGEN BAY	NORWAY	5	7
BERGITTA	NORWAY		1
BERTHEA	NORWAY		6
BEVERLEE	BAHAMAS		2
BIOKOVO	YUGOSLAVIA		6
BITTERSWEET	UNITED STATES		3

VESSEL NAME	FLAG	SST	ICE REPORTS
BLUEBELL SUSANNAH	LIBERIA		1
BONNY	BAHAMAS	5	
BORIS BUVIN	U. S. S. R.		2
BOW FOREST	NORWAY		7
BOW STAR	NORWAY	3	3
BRENT	LIBERIA		2
CAMILLA	FINLAND		23
CANMAR AMBASADOR	UNITED KINGDOM		23
CANMAR EUROPE	BELGIUM		22
CANMAR TRIUMPH	UNITED KINGDOM	5	12
CANMAR VENTURE	UNITED KINGDOM		11
CANMAR VICTORY	UNITED KINGDOM		11
CAPE ROGER	CANADA		1
CAPTAIN DIAMANTIS	GREECE		2
CAST BEVER	YUGOSLAVIA		9
CAST CARIBOU	YUGOSLAVIA	18	23
CAST HUSKY	BAHAMAS		2
CAST MUSKOX	BAHAMAS		6
CAST OTTER	BAHAMAS		11
CASTILLO DE LORCA	SPAIN	5	5
CASTILLO DE RICOTE	SPAIN		1
CECILIA DESGAGNES	CANADA		1
CELINE METZ	ST. VINCENT GRENADIN		1
CHICKASAW	UNITED KINGDOM		7
CICERO	CANADA		7
CLIPPER CRUSADER	PANAMA		4
CLIVIA	LIBERIA		9
COLDITZ	GERMANY		1
COMPANION EXPRESS	SWEDEN		2
CONSOLIDATED VENTURE	LIBERIA		1
CORNER BROOK	LIBERIA		5
CORNIDE DE SAAVEDRA	SPAIN		1
CRISTOFORO COLOMBO	ITALY	1	2
CRYSTAL B	CYPRUS		1
CYPRESS TRAIL	LIBERIA	1	1

VESSEL NAME	FLAG	SST	ICE REPORTS
DAISHOWA VOYAGEUR	PANAMA		3
DALMAR SPIRIT	NETHERLANDS ANTILLES		1
DAPHNE	MALTA		1
DENEBOLA	UNITED STATES		
DIMITRIS N	PANAMA		2
DISCOVERY	BELGIUM	1	2
DORA OLDENDORFF	SINGAPORE		1
DSR SENATOR	LIBERIA	2	
DUKE OF TOPSAIL	UNITED KINGDOM		2
DUSSELDORF EXPRESS	GERMANY		1
EAL RUBY	LIBERIA		5
EDWARD CORNWALLIS	CANADA		2
EL PIONERO	COLUMBIA		1
ELBE ORE	LIBERIA		1
ELIKON	BAHAMAS		1
ELISABETH	CYPRUS	2	2
ELSAM JYLLAND	DENMARK	8	8
ENDEAVOUR	UNITED STATES		8
ENDURANCE	SINGAPORE	2	1
ENERCHEM ASPHALT	CANADA		1
ENIF	SINGAPORE		1
ENSOR	LUXEMBOURG		2
ERNST HAECKEL	GERMANY		1
EUROPEAN CONFIDENCE	BURMA		2
EVELYN	ST. VINCENT GRENADIN	8	12
EVER GAINT	PANAMA		2
EVIMERIA	GREECE	1	1
FAIR ANNE	LIBERIA		2
FALCON	NORWAY	1	6
FAUST	UNITED STATES		2
FEDERAL CALUMET	LIBERIA		11
FEDERAL DANUBE	CYPRUS		9
FEDERAL MAAS	CYPRUS		14
FEDERAL POLARIS	JAPAN	6	7
FEDERAL SCHELDE	LIBERIA	8	12

VESSEL NAME	FLAG	SST	ICE REPORTS
FEDERAL ST CLAIR	LIBERIA		1
FEDERAL ST LOUIS	BAHAMAS		1
FEERAL THAMES	CYPRUS	4	16
FETISH	DENMARK		3
FINNARCTIC	BAHAMAS		1
FINNFIGHTER	FINLAND		6
FINNPOLARIS	BAHAMAS		1
FIONA MARY	NORWAY		4
FLAG PAOLA	GREECE		1
FLYING PHANTOM	UNITED KINGDOM		4
FORUM GLORY	GREECE		2
FREE TRADE	CANADA		1
FRONT FALCON	SWEDEN	5	5
FRONT HAWK	NORWAY		1
FULLNES	LIBERIA		1
FURUNES	PHILLIPINES		1
GEMINI	CYPRUS		1
GENERAL VARGAS	PHILLIPINES		2
GEORGE N	CYPRUS		2
GLOBAL DREAM	CYPRUS		1
GOLAR LIV	LIBERIA	3	2
GOLDEN STAR	CYPRUS		2
GOOD FAITH	LIBERIA		2
GORTENE	PANAMA		1
GRAND BARON	CANADA		1
HAFINA	BAHAMAS		2
HAPPY CHANCE	SINGAPORE	2	2
HARP	CANADA		1
HELENA OLDENDORF	PANAMA		1
HENRY LARSEN	CANADA		3
HERCEGOVINA	YUGOSLAVIA	10	9
HOFSJOKULL	ICELAND	2	9
HOUTMANGRACHT	NETHERLANDS		2
HUDSON	CANADA	1	3
HUMBER ARM	LIBERIA		1

VESSEL NAME	FLAG	SST	ICE REPORTS
IGMAN	YUGOSLAVIA	5	5
IKALUK	CANADA	11	16
IKAN SELAYANG	SINGAPORE		1
IMPERIAL BEDFORD	CANADA		7
INDEPENDANT PURSUIT	GERMANY		2
INDIRA GANDHI	U.S.S.R.	3	
INGRID GORTHON	BAHAMAS		3
IRENES BLESSING	GREECE	1	4
IRON MASTER	BAHAMAS		1
IRVING ARCTIC	CANADA		4
IRVING CANADA	CANADA		1
IRVING CEDAR	UNITED KINGDOM		1
IRVING ELM	CANADA		1
IRVING ESKIMO	CANADA	1	11
IRVING NORDIC	CANADA		2
IVAN DERBENYEV	U.S.S.R.		1
IVAN GORTHON	BAHAMAS		1
J C PHILLIPS	CANADA		5
JAHRE TRANSPORTER	NORWAY		1
JAPAN CARRYALL	JAPAN	1	1
JENNIE W	UNITED STATES		5
JO ELM	NETHERLAND ANTILLES	2	
JOH GORTHON	SWEDEN		3
JOHAN PETERSON	DENMARK		3
JOKULFELL	ICELAND		1
JOMAAS	NORWAY	13	13
KAAPGRACHT	NETHERLANDS		2
KAMTIN	UNITED KINGDOM	5	8
KAPETAN ANDREAS G	CYPRUS	1	1
KASABA BRIDGE	CYPRUS		1
KATSURAGI MARU	JAPAN	4	
KEEWATIN	CANADA		1
KEIFU MARU	JAPAN		1
KHUDOZHNIK PAKHOMOV	U.S.S.R.		18
KHUDOZHNIK PROROKOV	U.S.S.R.		3

VESSEL NAME	FLAG	SST	ICE REPORTS
KIHU	FINLAND		3
KLOSTER	CANADA		4
KOELN ATLANTIC	GERMANY		1
KOPALNIA RYDULTOWY	POLAND		5
KOSMAJ	YUGOSLAVIA	1	2
KOSMANAUT GAGARIN	U.S.S.R.		3
KRISTJAN PARLUSALU	U.S.S.R.		4
KRYMSKI GORY	U.S.S.R.		2
L' ROCHETTE	CANADA		2
L' AIGLE	CANADA		1
L.J. KOWLEY	CANADA		2
LA FRENAIS	FRANCE		1
LACKENBY	BAHAMAS		1
LADY FRANKLIN	CANADA		2
LADYLIKE	PANAMA		1
LAKE CHARLES	UNKNOWN		1
LAPPONIA	MALTA	1	3
LE CEDRE	CANADA		1
LE SAULE 1	CANADA		3
LEONARD J. COWLEY	CANADA		2
LIBERTY SKY	PANAMA		1
LISA D	PANAMA		1
LISTRAUM	NORWAY	1	3
LOTILA	BAHAMAS		2
LUCKY BULKER	HONG KONG		3
LUDWIGSHAFEN EXPRESS	GERMANY	1	1
LUMAAQ	CANADA		1
LUPUS	LUPUS	14	
LYNCH	UNITED STATES	4	
MAR CATARINA	SPAIN	1	1
MARE SERENO	ITALY		1
MARGIT GORTHON	BAHAMAS		4
MARGITA	SWEDEN		8
MARIA	NORWAY		3
MARIA GL	GREECE		1

VESSEL NAME	FLAG	SST	ICE REPORTS
MARIA GORTHON	SWEDEN		2
MARIKA	LIBERIA		1
MARJO	PANAMA		1
MARTHA II	NORWAY		5
MASSIMILIANO	BAHAMAS		1
MATHILDA DESGAGNES	CANADA		1
MATHIDE MAERSK	DENMARK		3
MAYA NO. 3	PHILLIPINES	1	2
MEKHANIK KHMELEVSKITY	U.S.S.R.	1	4
MELISSA DESGANES	BAHAMAS		1
MENTESE	TURKEY		2
MERAN	BAHAMAS		2
MERCADES ENVOY	PHILLIPINES		1
MERCHANT PRICE	BAHAMAS		3
MERSEY VENTURE	CANADA		2
MERSEY VIKING	CANADA		2
MLJET	YUGOSLAVIA	1	2
MONTE BONITA	PHILLIPINES		2
MOON BIRD	NETHERLANDS ANTILLES		1
MORGENSTOND II	NETHERLANDS		1
MOSEL ORE	LIBERIA		31
MOTHER HEROIC	CYPRUS		4
MOUTSAINA	GREECE		1
MSC CHIARA	ITALY	1	3
MUSSON	U.S.S.R.	1	11
NADEZHDA OBUKHOVA	U.S.S.R.		1
NOFTILOS L.S.	CYPRUS		1
NAUTILUS	CYPRUS	4	5
NEDROMA	ALGERIA		1
NEFTEKAMSK	U.S.S.R.		1
NEPTUNE GARNET	SINGAPORE		1
NEWFOUNLAND ALERT	CANADA		1
NIKOLAY GOLOVANOV	U.S.S.R.		5
NILAM	LIBERIA	3	3
NILE DELTA	BAHAMAS	1	1
NOBLE ACE	PHILLIPINES		1
NOMADIC PATRIA	NORWAY		4
NOMADIC POLLUX	NORWAY		2
NORD-ENERGY	DENMARK		3

VESSEL NAME	FLAG	SST	ICE REPORTS
NORDIC	LIBERIA		1
NORGAS CHALLENGER	NORWAY		1
NORGAS SAILOR	LIBERIA	11	
NORMAN MCLEOD ROGERS	CANADA		3
NORTHERN CRUISER	BAHAMAS		1
NORTHERN RANGER	CANADA		3
NOVA EUROPA	UNITED KINGDOM	1	2
NOVOMIRGOROD	U.S.S.R.		3
NURNBERG ATLANTIC	GERMANY		7
OCEAN CARRIER	LIBERIA		2
OCEAN COMMANDER	CYPRUS		2
OCEAN MERCHANT	CYPRUS		7
OCEAN SPIRIT	LIBERIA		1
ODET	FRANCE		4
OLEANDER	NETHERLANDS ANTILLES	3	
OLYMPIC MELODY	GREECE		3
ONDA	MALTA	1	5
OOCL ASSURANCE	UNITED KINGDOM		17
OOCL CHALLENGE	UNITED KINGDOM		17
ORAGREEN	BAHAMAS		1
ORIENTAL PATRIOT	CHINA		1
ORIOLUS	GERMANY		1
OSSOLINEUM	POLAND		2
OSTROV BERINGA	U.S.S.R.		2
PABLO METZ	ST. VINCENT GRENADIN		5
PACIFICA	PANAMA		2
PANTANASSA	BAHAMAS	8	8
PASSAT	U.S.S.R.		2
PATMOS	GREECE	2	3
PATSY AND SONS	CANADA		1
PAUWGRACHT	NETHERLANDS		1
PAWNEE	UNITED KINGDOM	12	12
PEACEVENTURE L	GREECE		1
PEGGY	BAHAMAS		4
PERMEKE	LUXEMBOURG		2
PETROBULK RAINBOW	LIBERIA		2
PHOLAS	UNITED KINGDOM	4	5
PIERRE RADISSON	CANADA		2
POKKINEN	BAHAMAS		6

VESSEL NAME	FLAG	SST	ICE REPORTS
POLAR NANOQ	GREENLAND		3
POLAR STAR	UNITED STATES	2	3
PAMORZE ZACHODNIE	POLAND		1
PREDATOR	MALTA	1	2
PRINSENGRACHT	NETHERLANDS		1
PROOF GALLANT	LIBERIA	1	1
PUNICA	LIBERIA		1
QUEST	CANADA		2
RAINBOW HOPE	UNITED STATES		1
RANI PADMINI	INDIA		2
REA	CYPRUS		1
REYKJAFOSS	ANTIGUA-BARBUDA		1
RIO CAUTO	CUBA		1
RIO GRANDE	BRAZIL		2
RIVER MAAS	PANAMA		1
S. KIROV	U.S.S.R.		2
SAC FLIX	SPAIN		1
SAILOR	CYPRUS		3
SALCANTAY	PERU		1
SALEKHARD	U.S.S.R.		2
SAN LORENZO	UNITED KINGDOM		1
SAPANCA	TURKEY		1
SASKATCHEWAN PIONEER	CANADA		3
SCOTIAN SURF	CANADA		2
SEA SONG	CYPRUS		1
SEA SPIRIT	CYPRUS		1
SEA TEAL	CYPRUS	17	16
SELATAN	CYPRUS		2
SENYA	CYPRUS		1
SILS	SWITZERLAND		6
SINGA ACE	SINGAPORE	1	1
SIR HUMPHREY GILBERT	CANADA		3
SIR JOHN FRANKLIN	CANADA		5
SIR ROBERT BOND	CANADA		2
SIR WILFRED GRENFELL	CANADA		3
SKOGAFOSS	ANTIGUA-BARBUDA		5
SKULPTOR MATVEYEV	U.S.S.R.		1
SLEVIK	NORWAY		1
SMYRNI	CYPRUS		1

VESSEL NAME	FLAG	SST	ICE REPORTS
SOLIDARNOSC	POLAND	4	0
SOLIMAR	PERU		1
SPLIT	YUGOSLVIA		2
STAR GRINDANGER	LIBERIA		1
STEFAN STARZYNSKI	POLAND		1
STEFANOS	GREECE		5
STOLT ASPERATION	PANAMA		1
STORK V	PANAMA		1
STUTTGART EXPRESS	GERMANY	1	1
SUWALSKA	POLAND		1
TADEUSZ KOSCIUSZKO	POLAND		2
TAMBOV	U.S.S.R.		1
TAPIOLA	NORWAY	1	0
TAVI	FINLAND		4
TAVERA	NORWAY		1
TEXAS	NORWAY		1
THALASSINI AVRA	GREECE		6
TORM MARINA	DENMARK		1
TRAVE ORE	NORWAY	14	6
TRONES	NORWAY		6
UNITED VENTURE	SINGAPORE		2
VADASTEINUR	DENMARK		1
VALIANT EXPRESS	LIBERIA		1
VARJAKKA	BAHAMAS		3
VESALIUS	BELGIUM	1	2
VICTOR BUGAYEV	U.S.S.R.		2
WAASLAND	LUXEMBOURG	1	10
WATERDRAGER	NETHERLANDS ANTILLES		1
WATERKLERK	NETHERLANDS ANTILLES		1
WATERSTROKER	NETHERLANDS ANTILLES		5
WERNER NIEDERMEIER	GERMANY		1
WESTERN SHIELD	NORWAY		2
WILLIAM	SINGAPORE		11
WIND SUNRISE	NORWAY		1
WLADYSLAW SIKORSKI	POLAND	3	3
WORLD DUET	LIBERIA	3	3
WORLD PRINCE	PANAMA	4	0
ZAMORA	CANADA		1
ZEUS	GREECE		5

VESSEL NAME	FLAG	SST	ICE REPORTS
ZHAN GRIVA	U.S.S.R.		3
ZIEMIA SUWALSKA	POLAND		3
ZIEMIA TARNOWSKA	POLAND		3
ZIEMIA ZAMOJSKA	POLAND		1
ZIM LIVORNO	GREECE	5	3
ZIM PUSAN	GREECE		1

Appendix B

Commanders of International Ice Patrol

Year of Command	Name of Commander	Year of Command	Name of Commander
1914	CAPT J.H.Quinan	1946 - 47	Commodore L.W. Perkins
1915 -16	CAPT F.A.Levis	1948	CAPT D.G. Jacobs
1919	CAPT H.G.Fisher	1949	CAPT J.F. Jacot
1920	LCDR O.F.A. DeOtte	1950	CAPT J.A. Glynn
1921	CDR A.L. Gambe	1951 - 54	CAPT G. Van A. Graves
1922 - 23	CDR B.M. Chiswell	1955 - 58	CAPT K.S. Davis
1924	LCDR W.J. Wheeler	1959	CAPT V.F. Tydlacka
1925 - 26	CDR H.G.Fisher	1960 - 62	CAPT R.P. Bullard
1927 - 28	CDR W.H. Munter	1963	CAPT J. E. Richey
1929	CDR T.M. Molloy	1964	CDR G. O. Thompson
1930	*CAPT C. M. Gabbett*	1965-66	CAPT R. L. Fuller
1931	LCDR N.G. Ricketts	1967-68	CDR J. E. Murray
1932	CAPT W.T. Stromberg	1969-70	CDR J. R. Kelley
1933	LT R.M. Hoyle	1971-73	CAPT E. A. Delaney
1934	CDR W. J. Keester	1974-77	CDR A. D. Super
1935	CDR E.D. Jones	1978	CAPT T. C. Volkle
1936	CDR R.L.Lucas	1979-80	CDR J. C. Bacon
1937	CDR G.W. MacLane	1981-83	CDR J. J. McClelland, Jr.
1938	CDR C.H. Dench	1983	LCDR A. D. Summy
1939 - 40	CDR E. H. Smith		
1941	CDR P.K.Perry	*1983-86	CDR N. C. Edwards, Jr.
1942 - 43	LCDR C.A. Barnes	1987-89	CDR S. R. Osmer
1944 - 45	LT E.R. Challender	1989 to present	CDR J. J. Murray

* International Ice Patrol first became a distinct command in October, 1983. Thus, CDR N. C. Edwards, Jr. was technically the first Commander, International Ice Patrol, and those prior to 1984 were senior International Ice Patrol officers.

Appendix C

Nations Currently Supporting International Ice Patrol

BELGIUM	NORWAY
CANADA	PANAMA
DENMARK	POLAND
FINLAND	SPAIN
FRANCE	SWEDEN
GREECE	UNITED KINGDOM
ISRAEL	UNITED STATES
ITALY	WEST GERMANY
JAPAN	YUGOSLAVIA
NETHERLANDS	

Appendix D

COAST GUARD AVIATION'S ROLE IN INTERNATIONAL ICE PATROL

by CDR J.J. Muray, Commander International Ice Patrol

Since its beginning Coast Guard aviation has played an important role in many Coast Guard missions, but it perhaps has been most vital to the unique International Ice Patrol (IIP) mission. IIP was established by international convention shortly following the tragic sinking of RMS TITANIC after the ship struck an iceberg in April 1912. IIP's job is to warn mariners of the threat posed by icebergs in the vicinity of the Grand Banks of Newfoundland. The key to determing the extent of the iceberg threat is iceberg reconnaissance. Although historically IIP did and continues to receive iceberg reports from a variety of sources, the primary source of iceberg information, particularly that which helps establish the "limits of all known ice", has been reconnaissance conducted by IIP itself. Through 1942 IIP iceberg reconnaissance was conducted by Coast Guard Cutters patroling the southern ice limits. When IIP was recommenced after the end of World War II, Coast Guard aircraft were introduced as surveillance platforms to supplement surface patrols.

Coast Guard aviation's support for the IIP mission clearly reflects the history of Coast Guard fixed wing aircraft. A PBY-5A "CATALINA" flew the first IIP flight in February 1946. That same year the PB4Y-1 "LIBERATOR" was introduced as the first dedicated IIP aircraft. From 1947 to 1958 the PB1G "FLYING FORTRESS" served as the IIP reconnaissance aircraft. The 1949 season was the first in which aircraft were the sole reconnaissance platform used. The R5D "DOUGLAS SKYMASTER" took over as the IIP aircraft from 1959 to 1963. During 1959 and 1960 the HU-16E "ALBATROSS" participated in iceberg demolition experiments. In late 1962 the HC-130 "HERCULES" (SC-130B) assumed the role of IIP aircraft. The HC-130 remained the sole IIP operational aircraft through 1988, a period of 26 years. In 1989 the HU-25B "FALCON" was introduced as an operational surveillance aircraft providing an alternative to the HC-130. Both of these aircraft flew IIP operational missions during the 1990 and 1991 seasons.

As the type of aircraft used for IIP has varied, so has the base of operations. From 1946 through 1966 IIP reconnaissance aircraft were based at Coast Guard Air Station Argentia, Newfoundland during the ice season. In June of 1966 Air Station Argentia was disestablished. However, IIP reconnaissance continued to fly out of Argentia as a detachment based at the U. S. Naval Station through 1970. In 1971 and 1972 the reconnaissance detachment operated out of the Canadian Forces Base at Summerside, Prince Edward Island. The detachment moved its base of operations to St. John's, Newfoundland in 1973 to get closer to the patrol area. Operations continued out of St. John's until moved to Gander, Newfoundland in 1982. Finally the base for the IIP reconnaissance detachment returned to St. John's in 1989 and remained there in 1990 and 1991.

The nature of IIP reconnaissance also has changed through the years. In the early years surface patrol vessels were employed in conjunction with aircraft to effectively accomplish the necessary reconnaissance. Early aerial reconnaissance was in essence purely visual since aircraft radar was ineffective at detection of icebergs and unable to discriminate between icebergs and ships.

Thus, while aircraft were infinitely more effective than surface vessels in conducting large scale visual reconnaissance during good flying weather, during poor weather the surface vessel had the advantage because of its surface radar ... and the Grand Banks area is renowned for poor weather. However the practice of routinely using surface patrol vessels to supplement IIP aerial reconnaissance was short lived, acknowledging the overall superiority of aerial reconnaissance. Since 1950 surface patrol vessels have been employed during only 5 seasons (1957, 1959, 1972, 1973, and 1980). Clearly IIP reconnaissance is highly dependent on Coast Guard aviation. In 1983 the use of Side Looking Airborne Radar (SLAR) was incorporated into IIP reconnaissance. SLAR has proven itself to be an excellent tool for the detection of icebergs. It also provides some ability to discriminate between icebergs and vessel targets. SLAR is essentially an all-weather sensor, although moderate to severe air turbulence drastically limits its usefulness. Each present-day IIP aircraft is SLAR-equipped: the HC-130 aircraft with a model AN/APS-135; the HU-25B with model AN/APS-131, part of the AIREYE system. The introduction of this sensor, coupled with improved ability to predict iceberg drift, precipitated a change in the strategy for aerial reconnaissance. Before 1983 aerial surveillance was accomplished by a detachment continuously deployed to the ice patrol area throughout the ice season and flying on an average of about every other day. Since SLAR became the primary iceberg sensor, the ice reconnaissance detachment deploys to its Canadian base approximately one out of every two weeks, flying every day when deployed. This approach allows use of aircraft supporting IIP to more readily support other Coast Guard missions as well. Using SLAR a typical HC-130 patrol will fly seven hours covering around 1700 track miles and a 27,000 square mile expanse of water. The more range-limited HU-25B covers a smaller area but usually can conduct two three-hour patrols daily.

In addition to their iceberg surveillance role Coast Guard aircraft also serve as platforms from which IIP conducts "airborne oceanography". From HC-130 aircraft IIP deploys satellite tracked drifting buoys which help define the ocean currents in the ice patrol area. This near real-time information is pivotal in the accurate prediction of iceberg drift. From both the HC-130 and the HU-25 aircraft, IIP deploys Air deployable eXpendable Bathy-Thermographs (AXBT) which determine the ocean surface temperature and thermal structure of the water column. This information is used to predict iceberg deterioration. The oceanographic information acquired in turn helps limit the amount of iceberg reconnaissance which is necessary.

Since 1946 Coast Guard aviation has played an increasingly more important role in the conduct of the IIP mission. Today IIP is highly dependent on Coast Guard fixed wing aircraft. With the outstanding support provided by Coast Guard aircraft and those who operate them the Coast Guard has been able to increase the effectiveness and efficiency of the IIP service it provides for mariners.